FLIGHT

The AIRCRAFT ENGINEER & AIRSHIPS

First Aero Weekly in the World

Founder and Editor: STANLEY SPOONER

A Journal devoted to the Interests, Practice, and Progress of Aerial Locomotion and Transport

OFFICIAL ORGAN OF THE ROYAL AERO CLUB OF THE UNITED KINGDOM

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Flight

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CONTENTS

INDEX AND TITLE PAGE FOR VOL. XII.

The 8-page Index for Vol. XII of "FLIGHT" (January to December, 1920) is now ready, and can be obtained from the Publishers, 36, Great Queen Street, Kingsway, W.C. 2. Price 1/- per copy, post free.

DIARY OF FORTHCOMING EVENTS

Club Secretaries and others desirous of announcing the dates of important fixtures are invited to send particulars for inclusion in the following list:

Mar. 20–22	Aero Club of France Grand Prix. 2nd stage
April 12 ...	Wilbur Wright Memorial Lecture, by Maj. G. I. Taylor, before R.Ae.S.
April 18–20	Monaco Seaplane Meeting
April 20–22	Aero Club of France Grand Prix. 3rd stage
May ...	Seaplane Contests on Lake Garde, Italy
June 1 ...	Entries Close for Schneider Cup
June 10 ...	Race, Lugo–Trieste–Triente–Lugo
Sept. 4–11	Brescia Races
Sept. 5 ...	Pulitzer Trophy, Detroit, U.S.A.
Sept. ...	Gordon Bennett Balloon Race
Sept. 30 ...	Provisional Date for Schneider Cup

EASTER HOLIDAYS

Owing to Good Friday, it will be necessary for the next issue of FLIGHT, dated March 24, to go to press earlier than usual. All copy, Editorial and Advertisement, should reach FLIGHT Offices not later than the morning of Friday, March 18.

EDITORIAL COMMENT

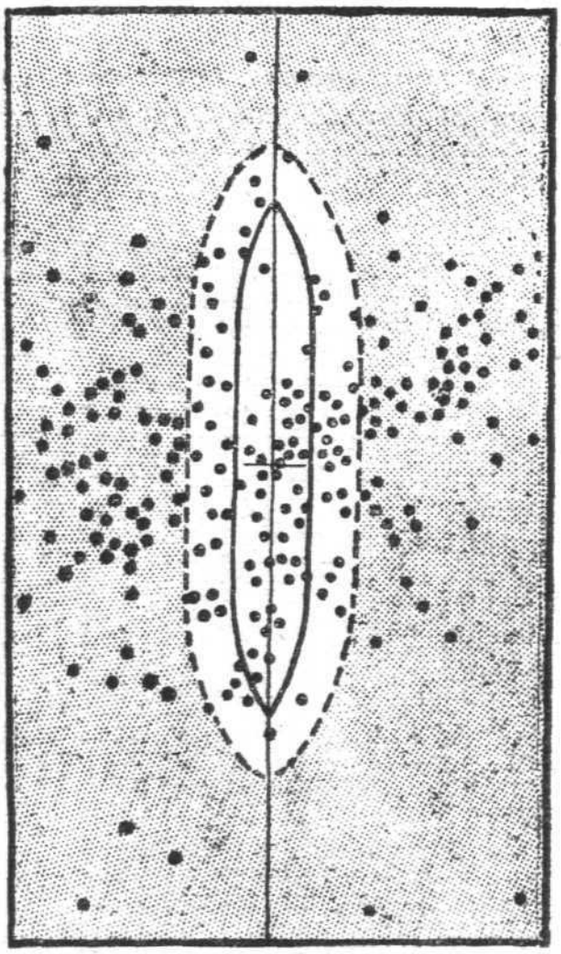
IN view of the recent discussion regarding the advisability of building capital ships for the Royal Navy, the results of certain bombing experiments carried out in the United States possess considerable interest, not to say significance. We reproduce in this issue of FLIGHT a diagram, taken from the *New York Herald*, of the results of the dropping of 251 bombs from a height of 6,000 ft. upon a target of the size of a modern battleship or battle-cruiser. This diagram shows that 55 direct hits were made, while 50 fell within the danger zone, making a percentage of 41 per cent. of destructive hits. Another experiment undertaken by the Navy Board and the Air Service jointly consisted in the exploding of a 1,650 lbs. British demolition bomb, containing 900 lbs. of amatol, between the two smoke-stacks of the battleship *Indiana*. The air experts came to the conclusion that direct hits on the deck and superstructure would break every electric light globe in the ship, throwing the vessel into absolute darkness between decks; disrupt telephone, radio, fire-control and other electric apparatus; fill with deadly gases the fire-room, engine-room, and all other compartments ventilated by forced draught; cause shell-shock to all persons within a radius of 300 feet; disrupt ammunition hoists, jam turrets, kill all the gun-crews and fire-control parties, and cause fires to break out which would explode all ammunition on the upper deck.

Aircraft in Naval War

We note that the naval experts contested these views, and pointed out that the *Indiana* was an obsolete ship, carrying much thinner armour than that borne by modern warships, that she was anchored, and that the bombs exploded on her deck were placed there, not dropped from aircraft. There is probably something in their contention, since we

have it on record that during the battle of Jutland capital ships sustained direct hits by the heaviest shells, and the dire results noted above did not follow. On the other hand, we lost three battle-cruisers which were hit at long range by salvoes, the angle of descent of the projectiles being nearly vertical, and thus reproducing to some extent the conditions under which heavy bombs dropped from aircraft would act.

The diagram to which we have referred is instructive in the highest degree. At the very least, it shows to what a state of relative perfection bomb-



This diagram illustrates bombs dropped from 6,000 ft. on a ground target representing a modern battle-cruiser. The dotted line shows the danger space. Two hundred and fifty-one bombs were dropped, of which it is claimed that 41·8 per cent. were destructive hits.

dropping sights and apparatus have been brought, and that bombing from aircraft has been reduced to a science almost as exact as naval gunnery itself. But it would not be fair to base definite conclusions upon results obtained by bombing a stationary target, and one that, more important than all, is not shooting back at the attacking aircraft. It is one thing to carry out an experimental operation in peace time, and quite another, as every War-pilot knows, to perform the same work under heavy anti-aircraft fire.

• • •

Air Power Indispensable

When, however, we have made every allowance for differences in conditions, it must be conceded by the most conservative that the possession of the command of the air must be an enormous factor in the issues of the naval battles of the future. Let us assume for the purposes of the argument that two armoured fleets are approaching each other with a view to joining battle. The one is accompanied by a swarm of bombing aircraft, the other is so weak in that arm that it cannot prevent its enemy from employing his aeroplanes as he intends. The latter fleet will first be attacked from the air, not by single machines but by large formations capable of dropping many tons of high-explosive bombs. It is highly probable that the aircraft will score a number of direct hits, besides dropping other bombs within the danger area. At least it must be assumed that this form of attack will cause a certain amount of material damage to ships and *personnel*. The air attack will also suffer casualties from gun-fire, but that is a secondary consideration provided the desired end is achieved. But scarcely less important than the actual damage such attack may inflict must be the disorder into which such an aerial attack will inevitably throw the fleet attacked and the almost equally bad effect on its *morale*. The fleet will have been proceeding at moderate speed in battle formation before the air attack became imminent. As the latter develops speed must be increased, with an attendant increase in the difficulty of control of fleet movements. Individual ships singled out for special attention will make rapid changes of course, leading to disorganisation of the battle-line. They must either do this or accept the alternative of almost certain damage, if not actual destruction, by the aerial bombardment. It is by no means inconceivable that a fleet, however ably commanded, and however high its initial state of discipline and *morale*, by the very nature of the conditions, will find itself hopelessly "clubbed," and an easy prey to the opposing battle-fleet which has not been exposed to the same experience of attack from the air.

Assuming that this represents a more or less faithful representation of what is likely to happen under the conditions outlined, it seems very clear that aircraft are likely to play as decisive a rôle in the sea battles of the future as they undoubtedly will in war on land. As a matter of fact, it is not at all certain that this rôle will not be even more decisive at sea, since there is a limit to the defence which can be adopted in the case of ships which is not set in land war. Armour, gun-power, and mobility are the defences which can be used to the best advantage at sea—but once ships are sighted by aircraft they cannot "go to ground" like armies. They must simply abide the issue.

We do not construe this into an argument against the building of capital ships. That is a matter upon which we do not presume to dogmatise. But what it does convey to the student is that, whether we believe or not that the final issue is with the battle-fleet, the navy that aspires to hold the seas must be equally as strong in the air as it is on the surface of the water.

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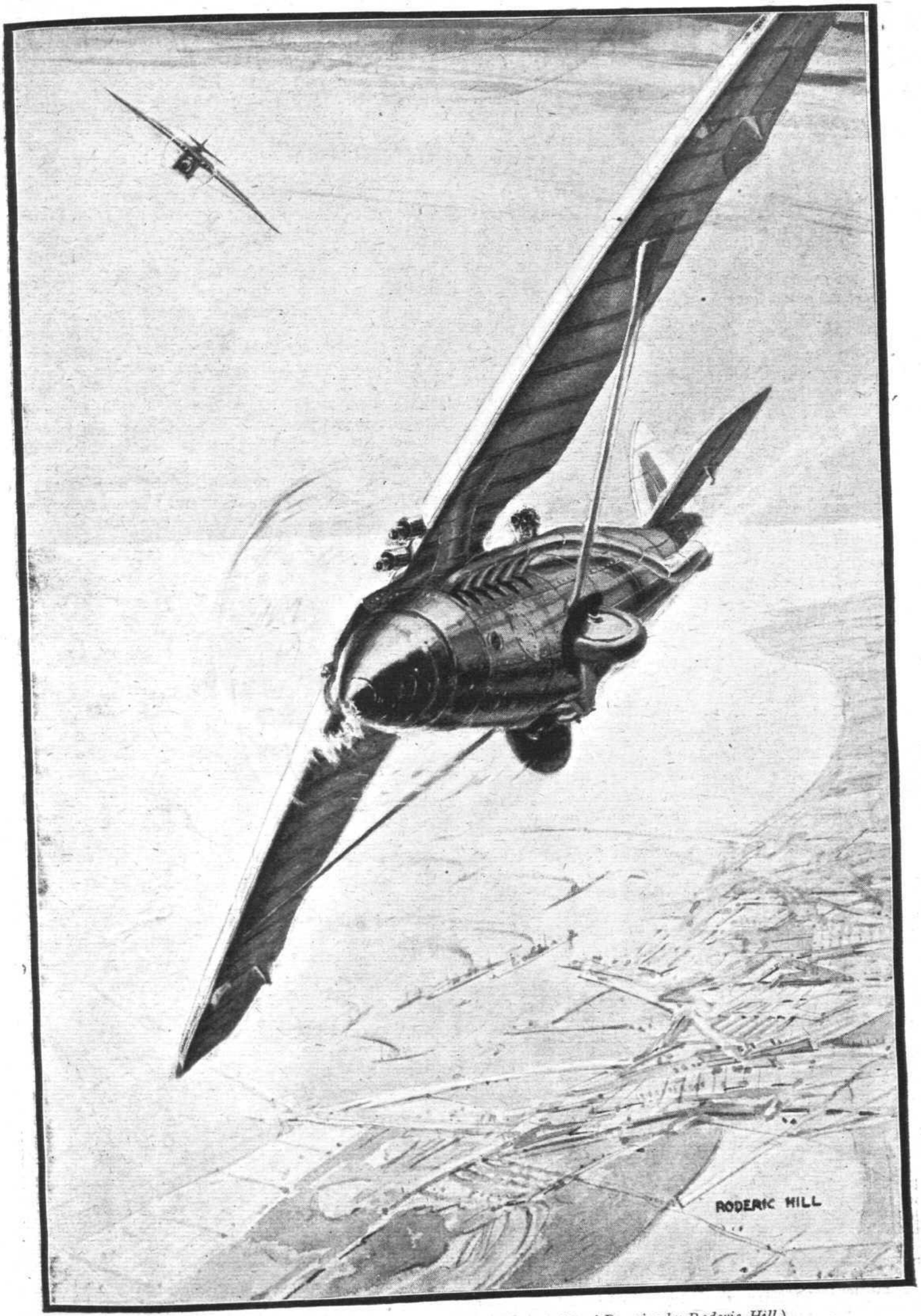
Mr. Churchill's Council of Three

During his speech on the introduction of the Air Estimates, Mr. Churchill expressed concern at the cessation of the last British cross-Channel air service, and stated that it was his intention to set up a Committee to explore the possibilities of maintaining such a service. The precise words he used were as follows :—

The sum of £60,000 is included in the Estimates for subsidies to civil aerial transport firms, and this was based on a



Aerial Policemen of the Near Future.—(*From the Original Drawing by Roderic Hill.*)

scheme proposed by Lord Weir's Committee for subsidising such companies to the extent of 25 per cent. of their gross earnings. Now, however, that the French Government have decided to grant to their own companies assistance on a most generous scale, I fear that if we adhere to the scheme of Lord Weir's Committee our firms will be so heavily undercut that there will be no encouragement for British lines to continue. I propose, therefore, to set up immediately a committee, including members of the aircraft industry and aerial transport firms, to devise the necessary alternative methods which will meet these changed conditions, and to make proposals for immediate action.

The manner in which he has kept his pledge to the House of Commons and the country is by the appointment of a Committee of three—Lord Londonderry, Sir F. Sykes, and Sir James Stevenson, all of them officials of the Air Ministry! With none of these gentlemen have we the slightest quarrel. Quite the contrary, in fact. Lord Londonderry, as Under Secretary for Air, has shown himself to be most friendly towards civil aviation and its development. To Sir Frederick Sykes is due a great deal of credit for the substantial progress made by the Department of Civil Aviation since it has been under his control, and that there is no longer any British civil aviation for him to control cannot be laid at his door. Sir James Stevenson also, as Vice-Chairman of the Advisory Committee on Civil Aviation, is an ardent believer in the future of the aerial transport movement. As a Departmental Committee this "Council of Three" is all that is admirable. It could have been strengthened by the inclusion of Gen. Seely as a member, and we do not altogether understand why he was not appointed to it, except that he is no longer actively associated with the work of the Air Ministry.

Where, however, are the members of the aircraft industry and aerial transport firms who were especially noted by the Air Minister for seats on this committee, which is to sit and examine matters vitally affecting their interests? In the first place, a very definite pledge was given—spontaneously, at that—that they were to be included. Why have they been left out? It is a significant and somewhat sinister fact that Mr. Churchill has gone to Egypt in company with Sir Hugh Trenchard, where together they are to arrange the sites for five powerful military air stations in the Suez Canal zone, on which no less than £670,000 of the British taxpayers' money is to be spent during the ensuing financial year. The military necessity at the moment of these stations is doubtful, while it can hardly be claimed that they can be of much use in the commercial developments of the future. We are coming to the belief that the fears we expressed recently that Mr. Churchill has committed himself to the development of the military side of flying and has ceased to visualise its more utilitarian aspects are very much founded on fact. While civil aviation is dying—if it is not indeed dead—in this country, the nation is being committed to costly and useless enterprises n the sands of the Egyptian desert.

We fail to see what good can come out of an enquiry conducted by an attentuated Committee such as that appointed by the Air Minister. Lord Londonderry called a conference last week, attended by a number of prominent members of the industry, constructional and operating, at which he explained the purpose of the appointment of his Committee, but we cannot see that it brought us much nearer to a resumption of British aerial services between this country and the Continent. The Committee is to take evidence and suggestions for infusing new life into the movement. We suggest that this is completely redundant. Everybody concerned knows exactly what is wanted. Let the Government follow the example set by France, and subsidise approved services adequately and immediately until such time as they are able to stand on their own feet. The Advisory Committee has outlined a workable scheme, which, if it were adopted by the Cabinet, would render it quite unnecessary to hold further enquiries which only entail a waste of valuable time.

There is no question but that the public will take full advantage of the greater speed of travel offered by the aeroplane service, provided conditions do not compel the fixing of passenger and freight rates at a prohibitive figure. In time—before very long, we believe—it will be possible, as new and suitable machines come into service and as more exact knowledge is obtained of how services should be organised and conducted, to make these services pay well. But that time is not quite yet, and adequate assistance must be extended to the pioneers—as the French are doing—to enable them to carry on through the initial stages. Nor will £60,000 assist much to the end in view.

If the Government really sets any store by the development of civil aviation, as we have repeatedly been told is the case, a much more generous view of responsibilities must be taken, and that soon, or it will be too late.

THE LONDON-CONTINENTAL SERVICES

FLIGHTS BETWEEN FEBRUARY 27 AND MARCH 12, INCLUSIVE

Route‡	No. of flights*	No. of passengers	No. of flights carrying		No. of journeys completed†	Average flying time	Fastest time made by	Type and No. (in brackets) of Machines Flying
			Mails	Goods		h. m.		
Croydon-Paris	20	47	10	14	20	2 55	Spad F-CMAY (1h. 51m.) ...	B. (5), G. (2), Sa. (1), Sp. (2).
Paris-Croydon	24	59	9	15	22	2 43	Spad F-CMAW (1h. 59m.) ...	B. (5), G. (2), Sa. (1), Sp. (3).
Cricklewood-Paris ...	—	—	—	—	—	—	—	—
Paris-Cricklewood ...	1	2	1	1	1	3 41	H.P G-EATK (3h. 41m.) ...	H.P. (1).
Croydon-Brussels ...	8	2	6	6	8	2 19	Airco 4 O-BADO (2h. 8m.)	A.4 (6), A.9 (1).
Brussels-Croydon ...	7	2	6	6	6	2 49	Airco 4 O-BATO (2h. 30m.)	A.4 (4), A.9 (1).
Totals for two weeks...	60	112	32	42	57			

* Not including "private" flights. † Including certain journeys when stops were made *en route*.

‡ Including certain diverted journeys.

FLIGHT
AIRCRAFT ENGINEER AND AIRSHIPS

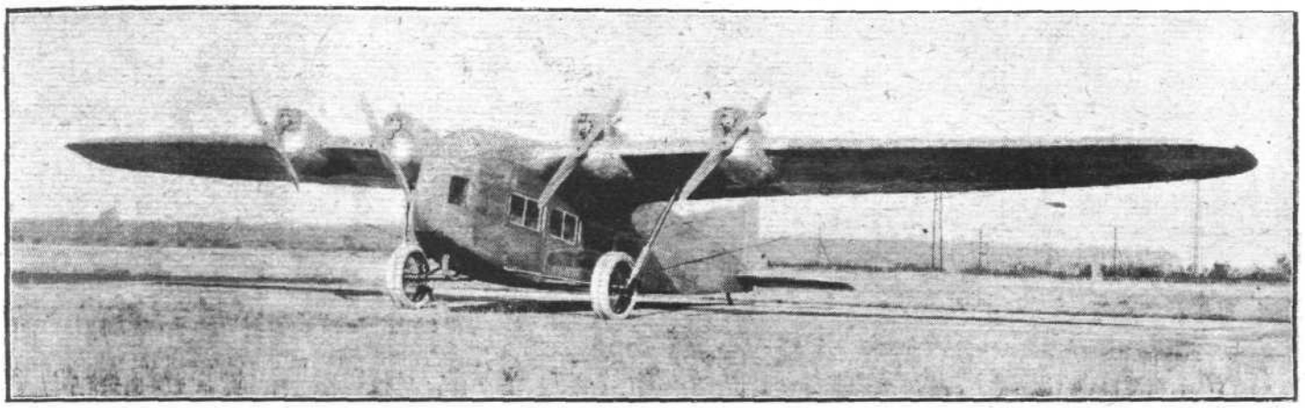
THE ZEPPELIN-STAAKEN ALL-METAL MONOPLANE

And a New Smaller Edition

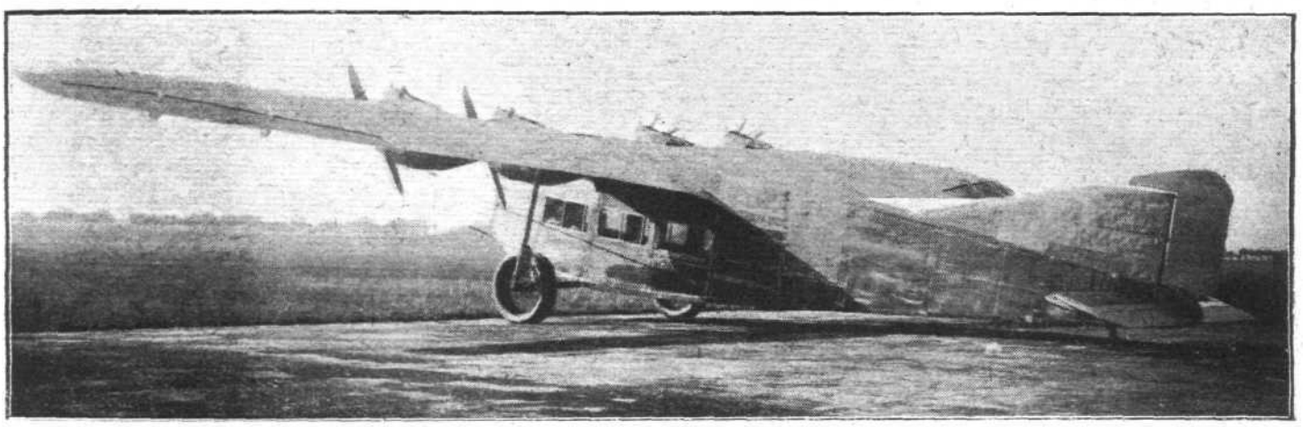
WE have already published several photographs of the Zeppelin-Staaken monoplane, and a brief description of the machine, which is built of metal throughout, even to the wing covering, the metal chiefly used being aluminium alloy. On its test flights this machine is said to have given very good results, so much so that it rather surprised its designer, Herr A. K. Rohrbach. We understand that a cruising speed of about 120 m.p.h. is attained, and that the full speed is somewhere in the neighbourhood of 135 m.p.h. The wing area is approximately 1,150 sq. ft., and the weight fully loaded about 18,650 lbs. This gives a wing loading of 16.2 lbs./sq. ft., which is extraordinarily high even considering that the wing is of high-lift section. We have no figures of the landing speed, but it must be rather high for a commercial machine. The power loading is about 18 lbs./h.p., so that if the figures given for maximum speed are correct, the machine appears to be extraordinarily efficient as regards resistance. So much so that one very much doubts whether such a speed has ever been attained by the machine, except in a steep dive. It is true that the heavy wing loading would tend to increase the average figure, which is based on a wing loading of 7 lbs./sq. ft., but even so it is doubtful whether the speed is possible for that power loading.

Our correspondent does not inform us of any tests having been made with cutting-out one of the outer engines, but the fact that the distance from these to the centre line is so great would almost certainly result in a turning moment of such magnitude that the corresponding engine on the other side would have to be cut out, or at any rate throttled down. Thus in practice the cutting-out of one engine would really mean the loss of practically half the power.

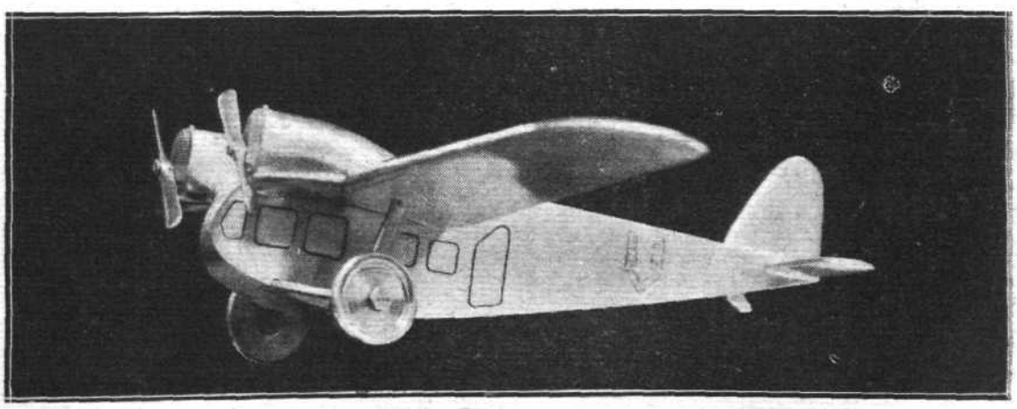
The results attained with this first machine have been so promising that a second one, of slightly different type, is now being constructed. This machine, of which no photographs are available yet, will have two engines only, as shown in the photograph of the wind-channel model of the machine published herewith. This arrangement should be much better, as the two engines, by being pushed far forward and kept as



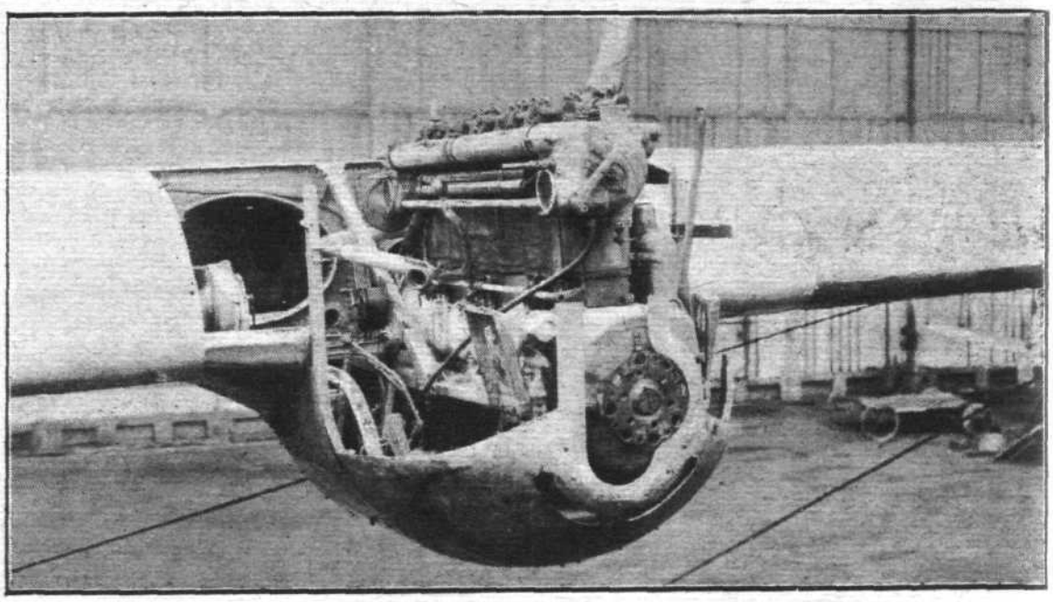
THE ZEPPELIN-STAAKEN MONOPLANE : Three-quarter front view.



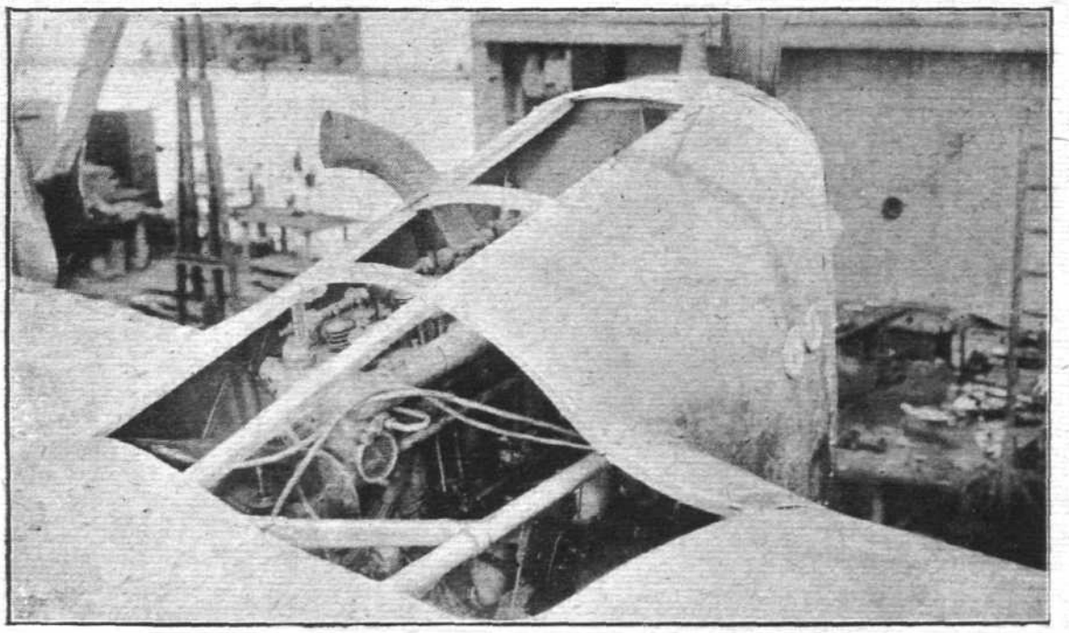
THE ZEPPELIN-STAAKEN MONOPLANE : Three-quarter rear view.



A new Zeppelin-Staaken Monoplane : Our photograph, the first to be published in this country, shows the wind channel model of this new machine which is now being built at the Zeppelin works. This machine, it will be seen, will have two engines only, placed comparatively close together, so that the turning moment when one engine stops should be quite small.



The Zeppelin-Staaken Mono-plane: View of the engine nacelle with cowling and radiator removed. In this photograph may be seen the very deep front wing spar, and the opening through which the mechanic crawls into the engine housing.



The Zeppelin-Staaken Mono-plane: View of the engine nacelle from behind.

close together as the airscrews will permit, are not far from the centre line of the machine. The object of placing the engines so far forward is evidently to help bring the nose of the *fuselage* back so as to avoid the gap between the two propellers that would otherwise be necessary if the body projected forward between them. What the effect on the front-wing spars will be is another matter. One would imagine that the down load in a dive, aggravated by the projecting engines, might prove somewhat heavy for the front-wing spars, especially as there is no top bracing. However, the wing is so deep in section that possibly the spar is capable of taking the stresses and allow of a reasonable factor of safety. Otherwise we think that the new monoplane is a great improvement on the older type. The cabin is low over the ground, and the door, when the tail is down, may be entered without the use of steps.

We do not know if the Inter-Allied Commission has passed this design, but for the sake of aviation in general it is to be hoped that the firm will be allowed to finish and test it, as it appears to incorporate ideas well worth trying out.

Educational Advisers to the Royal Air Force

THE Air Ministry has appointed Col. I. Curtis, M.A. (Cantab.), to be Educational Adviser and Capt. B. H. Sisson, B.A. (Cantab.), to be Assistant Educational Advisor to the Royal Air Force.

Col. Curtis, the first holder of the post of Educational Adviser, is an Associate member, Institute of Mechanical Engineers. He has wide educational experience, having served on the staff of the City Guilds Central Technical College, South Kensington, and the Royal Naval Engineering College. Later he occupied the position of Naval Instructor in the China and Mediterranean stations, being transferred in 1903 to the Admiralty as General Assistant to the Director of Naval Education. In 1909 he became Deputy Director of Naval Schools, a post he held until, on the formation of the Royal Air Force, he was loaned to the new Service, being appointed later the same year Deputy Director of Education in the Air Ministry.

Capt. B. H. Sisson, B.A. (Cantab.), was Ash Exhibitioner, Emanuel College, Cambridge, and was successful in the Mathematical Tripos, 1909. He has been Mathematical and Science Master at Haileybury College, and has held various other educational appointments at home and abroad. During the War he served in the Royal Flying Corps (1915-1917), and in the Royal Naval Air Service (1917-1918). In the latter period, as Flight-Comdr., he was Balloon Officer to the 1st Battle Cruiser Squadron, serving in H.M.S. *Lion*, and was mentioned in despatches. He has been engaged as a Staff Officer on educational duties at the Air Ministry during the past year.

FLIGHT
AIRCRAFT ENGINEER AIRSHIPS

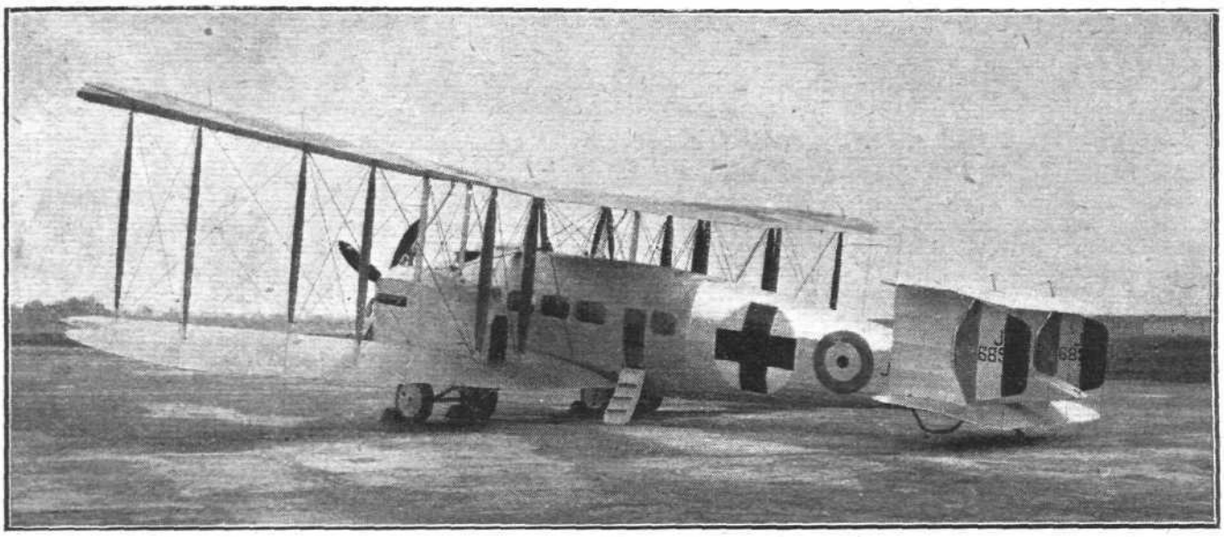
THE VICKERS VIMY-COMMERCIAL AMBULANCE MACHINE

Two 450 H.P. Napier "Lion" Engines

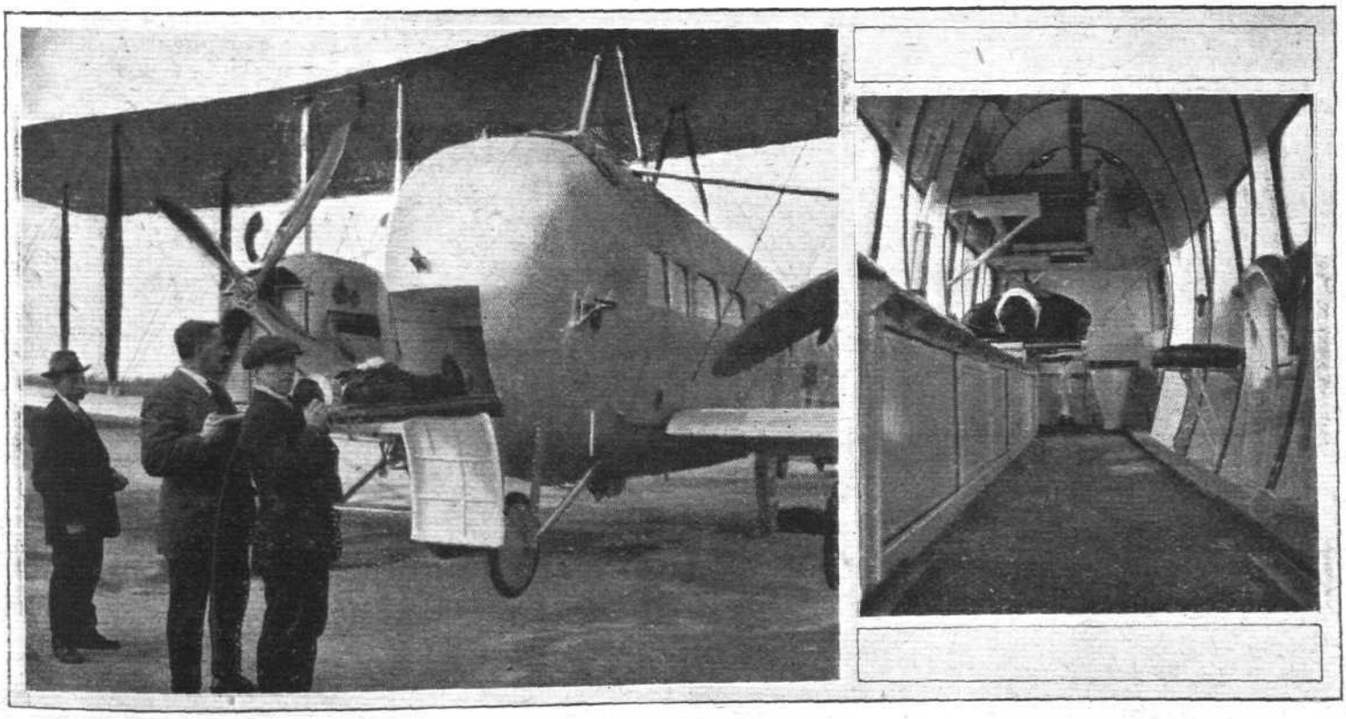
FROM time to time attempts have been made at using the aeroplane as an express ambulance, a function for which its high speed and smooth running eminently fit it. So far, however, such attempts have not been very serious, and have mostly been confined to fairly small machines which would only take one patient on a stretcher. Of a very different character is the new Vickers Vimy-Commercial Ambulance aeroplane which has just been finished at Messrs. Vickers' Weybridge Works. This machine, which is an adaptation of the standard Vimy-Commercial, has been designed to carry, in addition to pilot and engineer, a doctor, a nurse, four "stretcher cases" or eight "sitting-up cases."

The exceptionally roomy hull of the Vimy-Commercial affords ample space for the patients and plenty of room for moving about as regards the doctor and nurse. The arrangement of the racks for the stretchers is shown in the accompanying illustrations. When not in use the racks fold up out of the way. In order to facilitate getting "stretcher cases" into and out of the machine, a tunnel has been provided through the front wall of the cabin, under the pilot's cockpit, communicating, *viâ* a door in the nose of the machine, with the open. Thus it is possible to slide the stretchers in and out without having to turn around corners, guide rails being provided for sliding the stretchers easily. The stretchers, incidentally, are of the standard "General Service" type as used by the R.A.M.C.

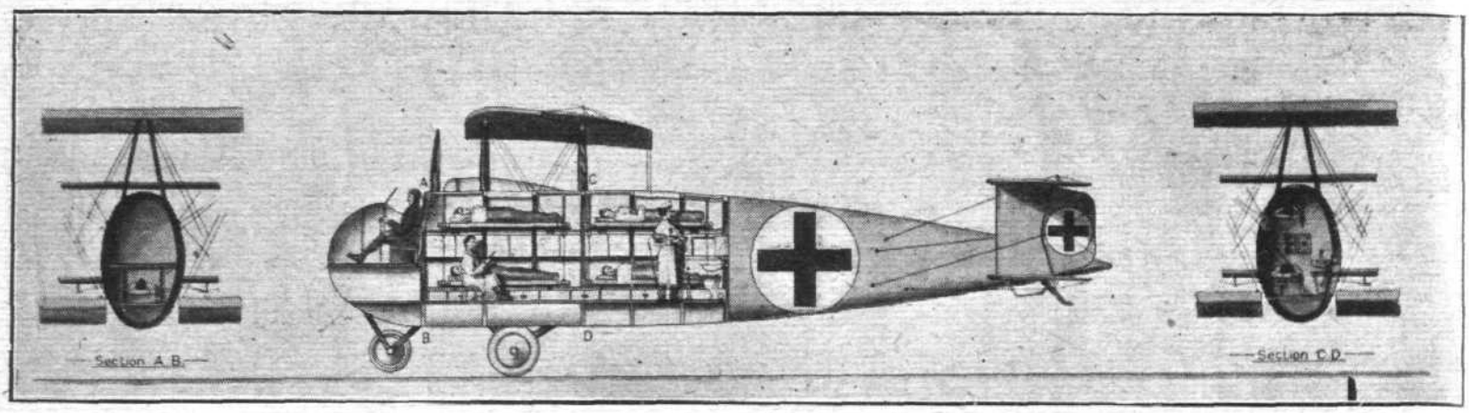
Provision has been made for maintaining an even temperature in the cabin under widely varying atmospheric conditions. On the front wall of the cabin is mounted a fan which forces air through a screen down which a constant trickle of water can be maintained. Thus in tropical climates the air in the cabin can be kept delightfully cool. The rate



THE VICKERS VIMY-COMMERCIAL AMBULANCE MACHINE : Three-quarter rear view.



THE VICKERS VIMY-COMMERCIAL AMBULANCE MACHINE : On the left is shown the door through which "stretcher cases" are placed in and taken out of the machine. On the right is an interior view, looking aft, showing racks, stretchers, seats, etc.



THE VICKERS-VIMY-COMMERCIAL AMBULANCE MACHINE : Pictorial sectional views showing arrangement of racks for stretchers, etc.

of flow of the water can be regulated from inside the cabin and the fan is provided with a drive which operates when the machine is standing on the ground.

The cabin is provided with lavatory accommodation and wash-basin, a 15-gallon water tank being provided for use with the lavatory pan and smaller separate tanks for wash-basin, cooling apparatus and for drinking.

In addition to the "medical" side of the equipment, the machine is provided with a wireless set so that the machine may at all times be in direct communication with the ground, both for transmitting and receiving instructions, etc., and for navigational purposes in misty weather.

As regards the machine itself little need be said, as it follows closely the arrangement of the standard Vimy-Commercial. There is one exception, however, which makes the machine interesting, apart from its function as an aerial ambulance. The two engines are Napier "Lions," of 450 h.p. each, and fitted with these the performance is considerably increased. Thus for cases of emergency the maximum speed can be increased to over 120 m.p.h., when urgent "cases" can be got to a base hospital in a very short time indeed.

The general specification of the Vickers Vimy-Commercial Ambulance is as follows:—Span, 68 ft.; overall length, 42 ft. 8 in.; height, 15 ft. 3 in.; chord 10 ft. 6 in.; gap, 10 ft.; area of main planes, 1,330 sq. ft. The load carried is as follows: Crew (pilot and engineer), 360 lbs.; four patients and stretchers, 760 lbs.; doctor and attendant, 360 lbs.; wireless equipment, 100 lbs.; water and tank (medical), 165 lbs.; medical equipment, 105 lbs.; stores, 200 lbs.; total, 2,050 lbs.; petrol, 167 gallons (5 hours) 1,200 lbs.; oil, 14 gallons 140 lbs.; reserve water, 4 gallons 40 lbs.; total load 3,430 lbs. If 8 "sitting-up" cases are carried the load is increased to 4,070 lbs. With full load as above the performance is as follows: Speed at 6,500 ft., 109 m.p.h.; climb to 6,500 ft. (with full load of 4,047 lbs.) 10 minutes; duration at 109 m.p.h., 5 hours.

THE ROYAL AERO CLUB OF THE U.K.

OFFICIAL NOTICES TO MEMBERS

ANNUAL GENERAL MEETING

THE Annual General Meeting of the Members of the Royal Aero Club of the United Kingdom will be held on Wednesday, March 30, 1921, at 3, Clifford Street, New Bond Street, London, W. 1, at 6 p.m.

Committee.—The following Members have been nominated for election to the Committee:—

Lieut.-Col. John D. Dunville.
Brig.-Gen. Sir Capel Holden, K.C.B., F.R.S.
Lieut.-Col. F. K. McClean.
D. C. MacLachlan.
Air-Commodore E. M. Maitland, C.M.G., D.S.O., R.A.F.
Flight-Lieut. D. G. Murray.
Lieut.-Col. Alec Ogilvie.
F. Handley Page.
Rear-Admiral Sir Godfrey M. Paine, K.C.B., M.V.O.
T. O. M. Sopwith.
Viscount Tiverton.

GREAT BRITAIN TO AUSTRALIA FLIGHT

It has been decided to present the Gold Medals of the Club to Sir Ross Smith and Sir Keith Smith at the Annual General Meeting of the Club on Wednesday, March 30, 1921, at 6 p.m.

RACING COMMITTEE

A Meeting of the Racing Committee was held on Wednesday, last, March 9, 1921, when there were present: Brig.-Gen. Sir Capel Holden, K.C.B., F.R.S., in the Chair, Major-Gen. Sir Sefton Brancker, K.C.B., Col. F. Lindsay Lloyd, C.M.G., C.B.E., and the Secretary.

Hendon Aerodrome.—The arrangements between the Club and the Grahame-White Company for the use of Hendon Aerodrome for aviation races were approved.

Aerial Derby, 1921.—It was decided to hold the Aerial Derby on Saturday, July 16, 1921, at the Hendon Aerodrome.

Jacques Schneider Race, 1921.—It was reported that the Aero Club of Italy had decided to hold the race at the end of July instead of September. It was decided to endeavour to get the date altered to September.

Proposed Cowes Meeting.—The report of Major-General Sir Sefton Brancker and the Secretary on their visit to Cowes was received, and it was decided to proceed with the arrangements for holding seaplane races during the Cowes Yachting Week.

Gordon Bennett Balloon Race.—It was decided that the Club should make three entries for the Gordon Bennett Balloon Race to be held at Brussels in the autumn.

COMMITTEE MEETING

A Meeting of The Committee was held on Wednesday last, March 9, 1921, when there were present:—Brig.-Gen. Sir Capel Holden, K.C.B., F.R.S., in the Chair, Major-Gen. Sir Sefton Brancker, K.C.B., Mr. Ernest C. Bucknall, Squadron-Leader T. O'B. Hubbard, M.C., R.A.F., Col. F. Lindsay Lloyd, C.M.G., C.B.E., Lieut.-Col. F. K. McClean, Lieut.-Col. Alec Ogilvie, Lieut.-Col. Mervyn O'Gorman, C.B., and the Secretary.

Election of Members.—The following New Members were elected:—

Flying-Officer Marion Hughes Aten, R.A.F.
Major John Bowley Quested, M.C.
Harry Tempest Vane, C.B.E.

House Committee.—Report of Meeting of House Committee held on March 8, 1921, was received and adopted.

Financial Statement for the Year 1920.—The Revenue Account and Balance Sheet for the year 1920 were submitted and passed.

Finance Committee.—Report of Meeting of Finance Committee held on March 8, 1921, was received and adopted.

Racing Committee.—Report of Meeting of Racing Committee held on March 9, 1921, was received and adopted.

Aviators' Certificates.—The following Aviators' Certificates were granted:—

7912. Thomas Wight Campbell.
7913. Alan Samuel Butler.

Aeronaut's Certificate.—The following Aeronaut's Certificate was granted:—

277. Frank Cave-Browne-Cave.

Airship Pilot's Certificate.—The following Airship Pilot's Certificate was granted:—

67. Frank Cave-Browne-Cave.

Offices: THE ROYAL AERO CLUB,
3, CLIFFORD STREET, LONDON, W. 1.
H. E. PERRIN, Secretary.

FLIGHT

CONFERENCE ON CROSS-CHANNEL AIR SERVICES

LORD LONDONDERRY, Under-Secretary for Air and Chairman of the newly-appointed Cross-Channel Subsidies Committee, on March 10 presided at a Conference, with representatives of the Aircraft Industry, at the Air Ministry on the question of the future of Cross-Channel Air Services. The other Members of the Committee, Sir Frederick Sykes, Controller-General of Civil Aviation, and Sir James Stevenson, Bart., were also present.

Lord Londonderry, in opening the Conference, said :

I am very much obliged to you for having responded to my invitation to attend the Conference today in connection with the question of Civil Aviation. I am very sorry that the Secretary of State, owing to his absence abroad, is not able to be here.

When my Right Hon. friend, the Secretary of State for Air, introduced the Air Estimates in the House of Commons last week on the eve of his departure on an important mission in connection with the Middle East, he stated that it was his intention to set up a Committee to explore the possiblities of maintaining an aeroplane service. The precise words which he used were as follows :

"The sum of £60,000 is included in the Estimates for subsidies to civil aerial transport firms, and this was based on a scheme proposed by Lord Weir's committee for subsidising such companies to the extent of 25 per cent. of their gross earnings. Now, however, that the French Government have decided to grant to their own companies assistance on a most generous scale, I fear that if we adhere to the scheme of Lord Weir's committee our firms will be so heavily undercut that there will be no encouragement for British Lines to continue.

"I propose, therefore, to set up immediately a committee including members of the Aircraft Industry and Aerial Transport firms, to devise the necessary alternative methods which will meet these changed conditions, and to make proposals for immediate action."

I regret to say that, owing to the shortness of time and the stress of other engagements, both on Mr. Churchill's part and mine, I had not the opportunity of discussing with him exactly what he had in mind when he made that proposal, but I have since received a Minute from the Secretary of State, whereby he sets up the proposed Committee in the following words :—

"I appoint a Committee to formulate proposals for immediate action in connection with the Cross-Channel services. Lord Londonderry will be Chairman, with Sir Frederick Sykes and Sir James Stevenson, Members. This Committee will confer with such representatives of the aircraft industry as they may think fit with a view to formulating a scheme."

No doubt you will at once perceive that the limitation of the Committee to myself and the other two gentlemen named, who are both Members of the Air Council, is somewhat at variance with the statements made in the House. I venture to think, however, that upon reflection you will all agree that this course of action has advantages. I may frankly tell you that since I received that Minute I have been losing no time in getting into the closest touch with several of the interests involved, and it has become increasingly apparent to me that, with the conflicting interests which undoubtedly exist, the problem is one that can be much more freely discussed and more easily solved by a committee of three, who have no interests but to further the good of the cause we all have at heart, and who have also not in any way any personal axe to grind.

This point of view has been, I am glad to say, frankly endorsed by certain individuals connected with your industry to whom I have put the point at issue. It seems to me that it is very essential in any investigation of this kind that there should be no clouding of essential information, nor any doubt in the minds of any witness examined that his evidence will be in any way abused, or his knowledge used for the benefit of a competitor. These, to me, are very important points, and I think they are all absolutely safeguarded by a Committee constituted according to the Secretary of State's minute.

There is another important aspect of this question. If we are to find additional money for the assistance of aerial transport, it has got to be found out of the Civil Aviation Vote, and before anybody could be in a position to discuss intelligently where economies could be effected, and consequently by what means money would be forthcoming, he would be required to be *au fait* with the financial arrangements of the Civil Aviation Department.

I can assure you that to start *de novo* on an investigation of this sort would take up much time and would make for much more delay than I can consider desirable in the circumstances.

I have, therefore, decided and I am sure that I can rely on your acquiescence and support—that the most expeditious method of tackling our vital problem is by confining the Committee as constituted in the Secretary of State's minute, and conferring with anyone and everyone connected with the industry—either in the way of construction or of transport—who feel that they can in the slightest way contribute to the solution we are seeking.

This being agreed, I think we might now turn our attention to discussing amongst ourselves the various aspects of the situation. The great difficulty, to my mind, with which we are faced, is that whereas there is a large amount of aircraft in existence, there is a very limited quantity of aircraft specially adapted for commercial purposes, and we fully recognise, not only that the construction of such aircraft requires time, but that same construction requires money. Here is the difficulty. It is contended that the Cross-Channel services have shown comparatively successful results. They have certainly provided valuable data, but in the absence of strong backing, and also owing to the fact that French subsidised companies are now in the field, and running at far cheaper rates owing to various causes, these same successful results are now more difficult to attain.

We have had before us several ideas as to the course which we should pursue. One suggestion is that the Government should purchase the machines adapted for commercial purposes and rent these same machines to air transport companies. This has the great advantage of maintaining aircraft construction at a period when these companies are operating under the greatest difficulty. Another suggestion is the guaranteeing against loss up to a certain figure with other considerations which require some detail and which I need not enter into at this moment.

There is a diversity of opinion as to whether a construction company should hold any interest in an air transport company. We are only concerned in this if a subsidy becomes necessary.

We are investigating every avenue which may lead to success.

Once more, I am most grateful to you for having responded to my invitation, and I hope that this afternoon everyone will freely put forward any opinion which he may have on this subject.

Amongst those present at the Conference were :—Brig.-Gen. F. H. Williamson (G.P.O.) ; Mr. H. White Smith (Bristol Aeroplane Co.), Commander Bird (Supermarine Aviation Co.) ; Mr. Parker (Messrs. Shorts, Ltd.), Mr. C. V. Allen, representing the Society of British Aircraft Constructors, Ltd.) ; Capt. de Havilland and Col. Marsh, representing the Royal Aeronautical Society ; Mr. Handley Page and Mr. Cogni (Messrs. Handley Page, Ltd.), Maj.-Gen. Sir W. S. Brancker, Mr. G. Holt Thomas, Col. F. Searle (Air Transport and Travel, Ltd.) ; Brig.-Gen. Caddell and Capt. Acland (Messrs. Vickers, Ltd.), Capt. de Valda (Adastral Air Lines, Ltd.), Mr. G. H. M. Kennedy (Air Post of Banks, Ltd.), Major Patrick (Bermuda and West Atlantic Aviation Co., Ltd.), Mr. Rhodes (Blackburn Aeroplane Co.), Mr. Haydn White (Commercial Wing Syndicate), Messrs. Instone (Instone Air Line), Capt. Ward (William Beardmore and Co.), Mr. Lord (A. V. Roe and Co.), Mr. Fulton (Messrs. Martinsyde, Ltd.) ; Lieut.-Col. W. A. Bristow (Messrs. Ogilvie and Partners), Capt. D. M. Greig (Air Express, Ltd.) ; Mr. Lovibond (Lep Aerial Travel Bureau), Representatives of the Westland Aircraft Works (Messrs. Petters), Mr. A. E. Baxendale, Col. Basil Foster, Mr. Elder-Hearn, Mr. Harold Hurlin, and Mr. Ingram.

Air Mail Services. New Posting Times

THE Postmaster-General announces that on and from Monday, the 14th instant, the latest times at which letters for transmission by the air-mail services to Paris and Brussels can be handed over the counter at certain post offices in London are twenty minutes later than at present, namely :—

G.P.O., 11 a.m. ; Threadneedle Street branch office, 10.45 a.m. ; Lombard Street branch office, 10.45 a.m. ; Parliament Street branch office, 10.25 a.m. ; Charing Cross branch office, 10.45 a.m. ; W.C.D.O., 11.5 a.m. ; W.D.O., 10.45 a.m. ; S.W.D.O., 10.40 a.m. ; S.E.D.O. and other district offices, 9 a.m. Registered letters must be handed in five minutes earlier in each case. The latest times of posting in the provinces remain unchanged.

FRENCH CIVIL AVIATION SUBSIDIES

THE following gives particulars of the amount of the French subsidy for Civil Aviation and the method of apportioning it :—

The sum of 33,215,000 francs (at par exchange £1,328,600), has been voted for civil aviation subsidies in France during the financial year 1921-22.

The subsidies to be granted are of two kinds :—

(*a*) A subsidy for purchase, and

(*b*) A subsidy for public transport.

In all cases the subsidies will only be granted, subject to the approval of the Under-Secretary of State for Air, to French subjects and companies employing French material and French pilots and *personnel*.

The total effect of the new regulations will be considerably to increase the amount of the subsidy. The purchase subsidy as also the subsidies for depreciation, crew and petrol can be obtained without carrying any commercial load.

Method of Allocation of Subsidies

(*a*) *Subsidy for Purchase.*—This subsidy consists of a grant by the State of half the value of machines employed for touring and transport by air, and will not be given to any business connected directly or indirectly with the sale of aeronautical material.

The types of machine to be subsidised, and the value thereof will be fixed by the Under-Secretary of State for Air. No subsidy will be given for aircraft built before July 1, 1920, and aircraft bought before January 1, 1921, which conform to the conditions laid down, will receive subsidies reduced in proportion to the number of hours already flown.

The purchaser receiving a subsidy must undertake : (1) That he will keep the machine in good condition and report to the Under-Secretary of State when it is unserviceable for any reason. (2) That the machine does not leave French territory without the consent of the Under-Secretary of State. (3) That he will not sell the machine without the consent of the Under-Secretary of State.

A list of the types of machines to be subsidised will be published later.

(*b*) *Subsidies for Transport.*—The subsidies for transport are granted only to legally constituted French companies, carrying out regular air services of recognised utility. The value of the subsidy varies according to the nature of the enterprise, the type of material employed, the regularity of the service and the commercial turn-over.

(i) *For time and distance flown, in francs per flying hour.*

(1) Amortisation (depreciation) .. $\frac{1}{2}\left(\frac{P + 1.5\,p}{200}\right)$ for land machines.

$\frac{1}{2}\left(\frac{P + 1.5\,p}{150}\right)$ for seaplanes.

(2) Crew .. $0.10\left(Em + \frac{n\text{HP}}{2}\right)$ for land machines.

$0.40\left(Em + \frac{n\text{HP}}{2}\right)$ for seaplanes.

(3) Transport .. $\frac{RV^2T}{1000}$ for land machines.

$\frac{1.6\,KV^2T}{1000}$ for seaplanes.

(4) Petrol .. $\frac{0.250\,n\text{HP}}{0.65} \times \frac{p'}{2}$ for stationary engines.

$\frac{0.320\,n\text{HP}}{0.65} \times \frac{p'}{2}$ for rotary engines.

Where P is the price of the aircraft as fixed by the Under-Secretary of State for Air.

Where p is the price of the engine as fixed by the Under-Secretary of State for Air.

Where p' is the price of the petrol, to be fixed quarterly.

Where Em is the average length of a stage on the route flown.

Where nHP is the horse-power.

Where K is a co-efficient depending on the average length of a flight, and on whether the route is entirely in France, crosses over French Africa, or is International.

Where T is the number of tons of commercial load carried.

Where V is the speed in kiloms. per hour at 2,000 metres.

(ii) *On Turn-over.*—This subsidy will be granted at the rate of 0.75 franc per passenger-kilometre and 0.005 franc per kilogramme-kilometre of goods, carried at fares and rates approved by the Under-Secretary of State for Air.

Special Conditions Governing Grant of Subsidies

(i) The company must possess a minimum number of machines equal to twice the quotient obtained by dividing by 200 (in the case of land machines), and 150 (in the case of seaplanes) the number of flying hours. (Represented by the total annual distance flown by the company's machines at a speed of 130 kilometres per hour.)

(ii) The company must employ as a minimum the following personnel :—

(*a*) One pilot for every three machines.

(*b*) One mechanic for every 300 h.p. utilised.

(iii) The rates and fares which may be charged by companies are fixed according to the following tariff laid down by the Under-Secretary of State for Air :—

Passengers 0.80 francs per passenger-kilometre.

Goods 0.015 francs per kilogramme-kilometre.

Reduction of Fares on Certain Routes

In effect, the new subsidies will produce the following reductions in passenger fares (for flying only, not including terminal charges) :—

Single fare Paris-London, reduced to 300 francs.

Single fare Paris-Strasbourg, reduced from 500 to 150 francs.

Single fare Paris-Prague, reduced from 1,500 to 500 francs.

ROYAL AERONAUTICAL SOCIETY NOTICES

Wilbur Wright Lecture.—The date of the Annual Wilbur Wright Lecture, which is to be read by Major G. I. Taylor, has been fixed for 8 p.m., on Tuesday, April 12, at the Royal Society of Arts. The title of the paper will be announced later.

Air Ministry Conference.—Capt. G. de Havilland, O.B.E., and the Secretary attended on behalf of the Society the Conference on Subsidies for Cross-Channel Aerial Transport Companies, held at the Air Ministry on Thursday, the 10th inst.

Engine Committee.—A Meeting was held at the Society's offices on Friday, March 11, to discuss the question of the type of engine and disposition of power-plant required for an aeroplane carrying mails (*a*) between London and Paris, and (*b*) over a 500 mile route. The following gentlemen attended : Lieut.-Col. M. O'Gorman (in the Chair), Col. L. F. R. Fell, Capt. G. de Havilland, Major G. H. Norman, Mr. H. Ricardo, Colonel F. Searle, and Mr. R. McKinnon Wood.

W. LOCKWOOD MARSH,
Secretary

NOTICES TO AIRMEN

Aerodromes for Civil Use : Amendments

NOTICE to Airmen No. 1 of 1921 (Aerodromes for Civil Use : Consolidated List) is amended as follows :—LIST C. *Licensed Civil Aerodromes.* (*a*) Civil Aerodromes licensed for all types. Stag Lane, Edgware Aerodrome should be added. (No. 25 of 1921).

Felixstowe : Salvage Operations

1. SALVAGE craft are at work in the fairway of Harwich Harbour removing the wreck of the S.S. *Marsa* sunk in the year 1917 in a position latitude 51° 56′ 55″ N., longitude 1° 18′ 09″ E. Explosives will be employed. The salvage vessel shows a red flag by day and a *red* light over a *white* light by night when lying alongside the wreck.

2. *Caution.*—Pilots in charge of aircraft are warned to exercise great caution when navigating in the vicinity of the wreck, and should proceed slowly if taxi-ing past it. No aircraft is to moor within two cables of the wreck, and all aircraft are to keep as far from it as possible when on or near the surface of the water.

3. *Authority.*—Admiralty Notice to Mariners No. 310 of February 22, 1921.

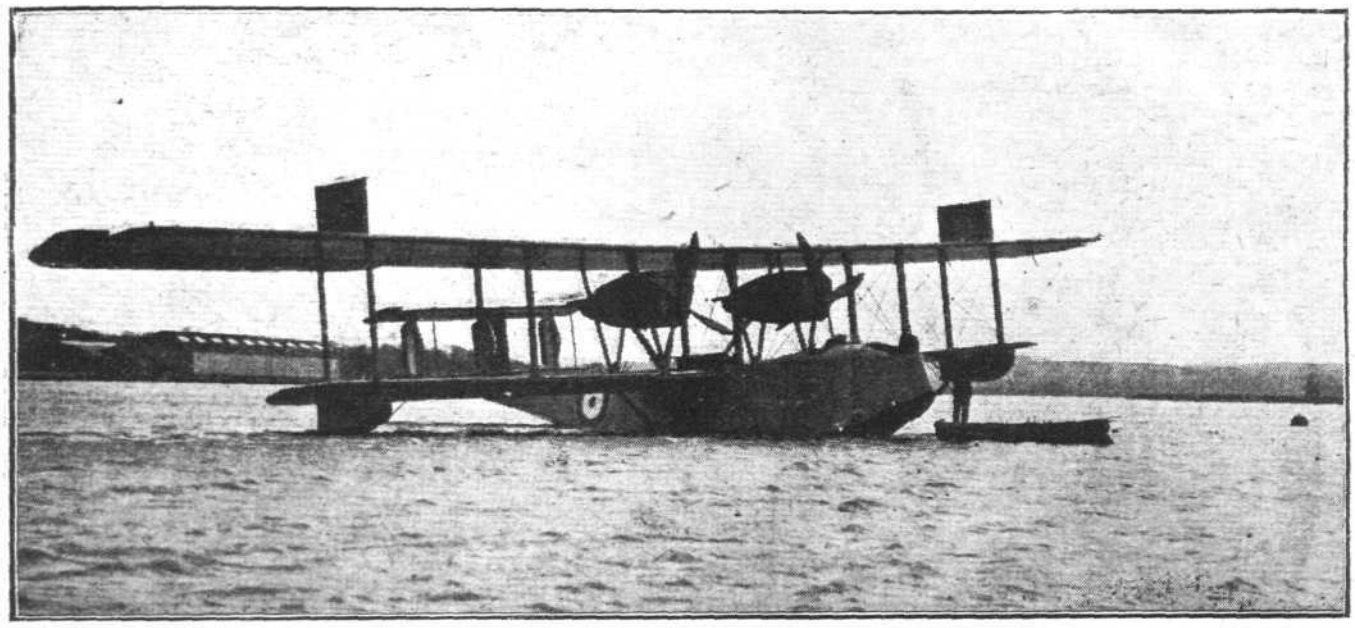
(No. 26 of 1921.)

FLIGHT

THE VICKERS-SAUNDERS FLYING BOAT "VALENTIA": TWO 600 H.P. R.R. "CONDOR" ENGINES

LAST week we were able to give a brief description of the newly-launched Vickers-Saunders flying boat "Valentia." We have now received a photograph showing this machine on the sea, and also a brief specification of the machine. The general layout will be seen from the photograph. Generally speaking, the "Valentia" is of orthodox design, showing the typical Vickers biplane tail and rudders, but with an overhanging top plane, braced by overhead wires running to rectangular king-post frames covered with fabric to provide fin area above the plane to balance that of the boat hull. The latter is flat-sided, with a Vee bottom and, of course, steps.

Electrical equipment	100 lbs.
Petrol (540 gals.)	3,888 ,,
Oil (50 gals.)	500 ,,
Reserve water (6 gals.)	60 ,,
	18,309 lbs.
Overall length	58 ft.
Overall height	22 ft.
Span	112 ft.
Gap	10 ft.
Chord	10 ft. 6 in.
Incidence of main planes	5 degs.



THE VICKERS-SAUNDERS "VALENTIA" FLYING BOAT: The engines are 600 h.p. Rolls-Royce "Condors," mounted on pairs of Vees between the wings.

The machine has an endurance of 8 hours at a speed of approximately 100 m.p.h. The maximum speed is about 110 m.p.h. Following is a brief specification:—

Estimated weight empty, with water ..	10,550 lbs.
Crew (5 men)	900 ,,
Sea anchor, line and sundries	152 ,,
Wireless	250 ,,
Military load (guns, ammunition, etc.) ..	750 ,,
Bombs (2-500 lbs. with gear)	1,150 ,,
Dihedral of main planes	1½ degs.
Area of main planes	2,000 sq. ft.
Weight per square foot	9.15 lbs.
Weight per h.p. (2 × 600)	15.25 lbs.

Time to 6,000 ft., all up and full throttle, 9.5 mins. Speed, 110 m.p.h.

Time to 10,000 ft., all up and full throttle, 19.25 mins. Speed, 106 m.p.h.

Endurance, 8 hours at 98 m.p.h.

SOME PROBLEMS IN THE DESIGN AND OPERATION OF AIRCRAFT

BY AIR-COMMODORE H. R. M. BROOKE-POPHAM, C.B., C.M.G., D.S.O., A.F.C.

UNDER the auspices of the Royal Aeronautical Society, a lecture was delivered by Air-Commodore Brooke-Popham, at the Memorial Hall, Manchester, on March 2, to members of the Manchester Association of Engineers and their friends on "Some Problems in the Design and Operation of Aircraft." The Air-Commodore stated that during the War, when money was of small account and time was everything, practical application got ahead of research, and under existing conditions progress would be slower and must proceed on firm conditions. There was an enormous field for development. In particular he thought there was a great future for the foundation of aircraft, designated amphibian, which operated on the surface of water as well as upon land, and also those which were specially arranged for landing on, and getting off, the decks of ships. It seemed likely that the British nation would be continually called upon to carry on small wars and in these aircraft would be of enormous value in saving life and expense. He emphasised the necessity for the fighting services keeping ahead of scientific developments.

In proposing a vote of thanks, Mr. Henry Pilling, President of the Association, expressed a hope that whatever amount of public money was allotted to the development of aircraft, the greatest care should be taken to establish an active and intelligent and competent research department.

Mr. John Lord, Director of A. V. Roe and Co., Ltd., Manchester, while agreeing that it is substantially true that little advance has been made in the efficiency of aircraft itself, mentioned as an instance of real increase in efficiency the Avro "Baby," 35 h.p. Green engine, on which Mr. Hinkler made his famous non-stop flight to Turin from London in 9½ hours. Mr. Lord called attention to the fact that the engine used was the identical one fitted to an early Avro tractor biplane 10 years ago. This machine made a flight from Brooklands to Brighton in one hour twenty minutes, which was considered a record flight at the time. That machine had a speed of about 45 or 50 m.p.h. The modern Avro "Baby" has a speed of 85 to 90 m.p.h., and at the end of his flight, Mr. Hinkler had to rise to an altitude of between 13,000 and 14,000 ft. to clear the Alps. That, Mr. Lord said, showed that very considerable progress had been made in the matter of the aeroplanes themselves. One of the reasons why the small sporting aeroplane has not become more widely adopted by the general public was, he thought, the high cost of maintenance. In that connection it was interesting to note that the "Baby" on the Turin flight flew at an average speed of 70 m.p.h., and used just over two gallons per hour, so that the petrol consumption worked out at 30 miles per gallon at least. That compared very favourably with the petrol consumption of a car engine.

CAMBRIDGE UNIVERSITY AERONAUTICAL SOCIETY

(OFFICIAL ORGAN "FLIGHT")

ON February 23, 1921, a most interesting and instructive paper was read by Professor L. Bairstow, F.R.S., C.B.E., F.R.Ae.S., entitled

"The Control and Stability of Aeroplanes."

Professor Bairstow in his introduction pointed out that so long as an aeroplane is within its "normal range" of speed, there are few difficulties, but that, as it is just when the machine gets outside this "normal range" that trouble commences, we ought to make a study of non-normal flight. After mentioning such troubles as engine failure, resulting in forced landings, which has nothing to do with control and stability, the lecturer referred to the danger of spinning into the ground as a result of turning without the engine, and to the difficulty of flying in fog and mist. The latter is facilitated by fitting turn indicators; a compass course can then be held and the horizontal balance of the aeroplane maintained by (1) Keeping the turn indicator at zero. (2) Keeping the bubble of the cross level at zero, and (3) Flying to compass. Most aeroplanes tend to deviate widely from the straight if uncontrolled. The causes are complex; lack of symmetry of rigging; slipstream effects on the fin and rudder; and lateral instability. Both the latter are common features, and the study of them has been greatly neglected, owing to lack of appreciation of the importance of the problem by the authorities. There is no difficulty in principle in producing an aeroplane which will not, with controls locked, tend automatically to bank to an angle of 50 or 60 degrees. The difficulties of application are those of detail. On the effect of size, the lecturer said that as the aircraft gets bigger, the forces on the control column and rudder increase, and the pilot becomes relatively less and less powerful. Balancing the control surfaces is not an adequate remedy, and we should study the natural motions of aircraft by the methods of stability, and so find out what mechanisms are suitable. That this can be done is clear from papers written at the N.P.L. by Nayler and myself on flight in a natural wind. It is shown that the movements of the elevator to correct for gusts are not wholly arbitrary, and can be produced to a high degree of approximation by suitable fluid damping. Professor Bairstow stated that, after the reliable engine, the most important element in the progress of aviation is the reliably stable aeroplane.

Slides were then shown of diagrams representing the well-known instability of cambered wings. A curve was drawn, having as absissa the speed in m.p.h. and as ordinate the moment coefficient about the c.g. This was the wing curve. Another curve was shown for the tail, whose object is, of course, to produce an opposing couple to that from the wings. The difference is the moment acting on the aircraft. With an unstable aeroplane, the lecturer said, it is only necessary to hold the stick steady to find out, that one of two things occurs. Either the machine goes straight into a steep dive, or it stalls. If it stalls and is controlled laterally a steep dive rapidly follows. If stalling occurs, and lateral control is not exercised, or is ineffective, the result is a spin. The remedy for this defect is simple in principle but troublesome in application. Movement of the tail plane alone is useless. The real corrective is to move the c.g. forward relative to the wings, which is usually attained by shifting the top wing further back.

Professor Bairstow then referred to some observations made on a complete model of an S.E. 5, corresponding to the following positions of the c.g. from the leading edge: 0.2, 0.3, 0.4 and 0.5. It was found that the aeroplane would be very stable with the c.g. forward at 0.2 of the chord. The amount of movement of the control to change the speed from 100 m.p.h. to 60 m.p.h. was very large (about 20 degrees) and would impose limits on the manœuvrability. With the c.g. at 0.3 of the chord the aeroplane was very sensitive to elevator position over a large speed range (120 m.p.h. to 80 m.p.h.) but became very stable at landing speeds of 55 to 60 m.p.h. With the c.g. position at 0.4 of the chord the aeroplane would be unstable at high speeds, but more controllable at landing speed. The last instance (0.5 chord showed the aeroplane to be violently unstable, and also heavy on controls. The lecturer then showed some records obtained on stable aeroplanes, showing how the oscillations were damped and tended to die down altogether. He then said that it is to be hoped that the stability of the aeroplane will now receive the attention which has in the past been devoted to performance. It is easy to make an unstable aeroplane. It is not difficult to make a very stable aeroplane. On the other hand, it needs considerable care to give an aeroplane a desired degree of stability. It is to be hoped that we have for ever ceased to regard stability with indifference or as an undesirable quality which tends to diminish the skill required of the pilot.

With regard to lateral stability Professor Bairstow said that the application of the theory of stability to the lateral motions of an aircraft is far less advanced than the application to longitudinal motions. Pilots and others have not yet distinguished clearly between lack of trim and instability. He then referred to instability at large angles of incidence and dealt at some length with auto-rotation experiments, showing slides of models mounted in the wind channel. Such models had been found to rotate about an axis in the wind direction with a definite speed for each angle of incidence, the speed of rotation also depending upon the wind speed.

In conclusion Professor Bairstow quoted the final paragraph from his lecture to the Royal Aeronautical Society about two years ago, saying: "Once it is conceded in the necessary official quarters that the study of stability is important, there will be no difficulty in beginning the progressive collection of data, but if this work is to proceed satisfactorily it is necessary that an appreciable part of the time of the staff of the N.P.L. and the R.A.E. shall be continuously devoted to it. Incomparably more laborious than that relating to performace. It is work which can only be broken into at frequent intervals at a cost of serious loss of time and accuracy, and in the days to come, when the number of aeronautical engineers with mathematical knowledge is sufficient for the needs of the industry, this data will be the fundamental stock-in-trade. The immediate needs of the industry have much support, but a policy of looking two or three years ahead has fewer advocates in spite of the fact that such provision is necessary if Britain is to keep her lead in the air."

Aircraft and the Navy Estimates

IN a long memorandum, which accompanies Lord Lees' statement upon the Navy Estimates, reviewing the history of the past year, the following reference is made to naval air development, which rather discounts the impression that the Admiralty have been blind to the extension of sea-power through the development of aircraft:—

During the year the Naval Staff has been in close co-operation with the Air Staff both in matters of development and the tactical use of aircraft for Naval purposes. The information gained from exercises and experiments has been fully interchanged, and specifications for improved designs of aircraft have been laid down. It is hoped that during this financial year the air equipment of our fleets with heavier-than-air craft will make a big stride.

With regard to the suspension of the provision of airships for the Navy, the memorandum says:—"The Air Ministry informed the Admiralty that the economies imposed upon them in the preparation of the Air Estimates would compel them to reduce considerably the provision of heavier-than-air craft unless the Airship Service was suspended. The Admiralty considered that any such reduction in the vital Naval requirements in heavier-than-air craft, which are essential to Naval efficiency, and to which Naval votes are heavily committed in the provision of aircraft carriers, could not be accepted. While the Admiralty regret the decision of the Air Ministry to suspend the Airship Service, they realise that in view of the stringent financial restrictions, no other decision could have been arrived at. The limited funds now available to meet Naval air requirements will, therefore, be expended on heavier-than-air craft instead of on airships. In view of the importance of training R.A.F. *personnel* in Naval work, arrangements have been made to put an aircraft carrier at the disposal of the Air Ministry for certain periods for this purpose."

In a comparative table of the world's navies, Great Britain is the only country shown as having aircraft carriers, specially designed as such. The number is given as three, and includes *Furious*, *Argus* and *Eagle*, which, although not actually carriers, were very extensively altered, and it is claimed may be considered to embody lessons of the War.

FLIGHT
THE AIRCRAFT ENGINEER AND AIRSHIP

AIRISMS FROM THE FOUR WINDS

WHETHER the Egyptians want Mr. Winston Churchill or not, due air homage was done to his great Hatship on arrival (with five hat-boxes amongst his impedimenta) by an escort of a flight of aeroplanes—three Bristol fighters and three H.Ps.

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THAT was a fantastic peep of "H.H.'s" into the future of aerial warfare in the *Daily Mail* recently. An "air-ram" having a steel prow with which to ram its opponent, and wings which, as well as the propellers, fold into the body when the machine swoops down on its prey. Being inside a projectile and fired out of a gun seems almost tame in comparison. What we specially like is the notion of steering this "bolt from the blue," with wings tucked away inside the hull, "to a hair's breadth." The pilot, "in a well-protected cockpit" (he would need it), might find some difficulty in keeping quite such a good course as that. In fact, without wings one does not see how he is going to keep any course at all except that assigned to him by our old enemy gravity. However, it is a cheerful thing to contemplate, and as the "bolt" is said to be designed for an engine of 3,000 h.p. there does not appear to be any immediate danger.

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ANOTHER pleasant little prospect for future frightfulness is foreshadowed in the news to hand from New York of the discovery of that liquid poison by an officer of the U.S. Chemical Warfare Service, which, it is claimed, is so strong that three drops will kill anybody whose skin it touches. In its practical application it is suggested that, falling like rain from nozzles attached to an aeroplane, the poison would kill practically every one in the area over which the aircraft passed. One machine carrying two tons of liquid could cover an area 100 ft. wide and seven miles long. According to the officer, the only limit to the quantity of the poison that could be made is the amount of electric power available. Nearly every nation, it is declared, possesses practically an unlimited supply of the necessary raw materials.

Yes, really quite pleasant to look forward to.

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SIR ROSS SMITH, in his most entertaining "Travelogue" at the Philharmonic Hall, tells an amusing episode from the famous flight to Australia. On alighting at one of the stopping-places in the East, the natives were found to exhibit a most unusual timidity, and seemed afraid of approaching the Vimy. For a time their behaviour mystified the aviators, until an English resident solved the riddle. He and some of his friends had played a joke on the unsuspecting natives, telling them that a huge bird was going to fly over from the other side of the world, and would carry God on its back, carrying with him the devil as a prisoner. After a considerable time the natives ventured closer, probably, Sir Ross assumed, to find out who was who. He was, he said, quite certain in his own mind on this point, but his brother Keith entirely disagreed.

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ANOTHER little point made in Sir Ross' many rich items is in regard to the letters "G.E.A.O.U." which the Vimy bore, all of which have their official significance, but which were rendered by those taking part in the big adventure as meaning, "God 'elp all of us."

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How an impromptu reply first gave the idea to Sir Ross Smith to attempt the Australian flight is set out in the following item from his "Travelogue":—

"Brigadier-General A. E. Borton visited the first Australian Squadron in Palestine, and invited me to join him on a flight to Mesopotamia. After reaching Bagdad, he jocularly remarked, 'We will fly on to India, to see the Viceroy's Cup run.'

"I replied, 'Why not then fly on to Australia and have a look at the Melbourne Cup?' I little thought then I should ever attempt such a journey."

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JERUSALEM THE GOLDEN apparently is associated with the evolution of aviation. According to Mr. Percy E. T. Sargent when lecturing before the British-Israel-World Federation at Caxton Hall the other day, "three prophecies were fulfilled at one time by the British occupation of Jerusalem."

He was advocating the belief of the Society that the British are the descendants of Israel, and described how the Turks, after being driven from the Holy City without a shot being fired, took up a position later with the object of recapturing it.

But British aeroplanes went up and drove them from their stronghold, so fulfilling the first of the Biblical prophecies: "As birds flying, so will the Lord of hosts defend Jerusalem, defending also he will deliver it, and, passing over, he will preserve it."

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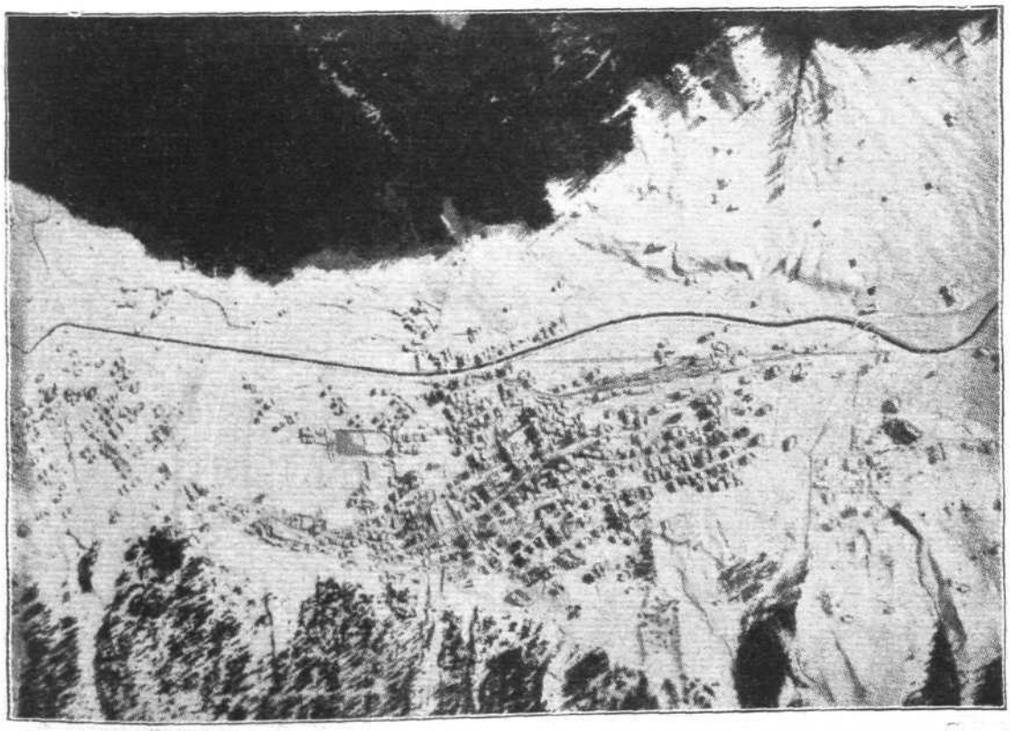
THE R.A.F. is quite busy on the Rhine "front" just now The hitherto "no man's land" of the neutral zone is no longer an unknown land.



Winter in Switzerland: An airscape of the popular resort, Davos: Note the main road in the centre cleared of snow.

FLIGHT

March 17, 1921

SOME PRACTICAL POINTS IN THE STRUCTURAL DESIGN OF AIRCRAFT*

By A. P. THURSTON, D.Sc., M.I.A.E., M.I.Ae.E. (Hons.).

Positions of Loading.—Before proceeding with the structural design it is necessary to decide upon a number of standard positions of loading. These standard positions are as follows :—(*a*) Up load on wings with C. of P. in advanced position (0.28 width from front edge). (*b*) Up load on wings with C. of P. in rearward position (0.5 width from front edge). (*c*) Down load on wings with C. of P. in advanced position (0.25 width from front edge). (*d*) End load on wings in diving. (*e*) Load on leading edge, tending to collapse nose and twist front spar. (*f*) Vertical load on body at tail. (*g*) Vertical load on body at engine bearers. (*h*) Horizontal load on tail. (*i*) Twist on tail. (*j*) Vertical load on tail plane and elevators. (*k*) Horizontal load on rudder and fin. (*l*) Load on control and control levers. (*m*) Load on ribs with C. of P. in advanced position. (*n*) Load on ribs with C. of P. in rearward position.

The crux of efficient and safe structural design consists in securing ample but not excessive load factors on each of the above systems of loading.

The Maximum Loads under the above conditions of loading may be determined by the following methods :—

(*a*) Evolutions carried out over a camera obscura. From the chart obtained by marking the position of the machine at given small intervals of time the apparent load on the machine in terms of gravity at any instant of time may be calculated. By this method it has been found that looping may cause loads equal to 3.5 times the normal load, and steep vertical turns and rolls may produce loads of 4.5 times the normal. In a modification of this method a cinematograph may be used, but this method has not been developed at the present time.

(*b*) Evolutions carried out with a recording or other accelerometer on board. The successful and ingenious instrument used on aircraft is due to Maj. Wimperis. According to the record loads up to three times gravity have been recorded in looping, and up to four times gravity in vertical turns and rolls.

(*c*) The maximum loads in flight and the shocks on landing may also be obtained by maximum recording extensometers attached to certain members. This method was used by the writer in 1916, with promising results, but time did not permit its full exploration. A modification of this method consists in recording the maximum deflections of the axles and springs on landing and when running over ground. This method was found effective and provided the data which was used in designing undercarriages.

The Load Factors for each of the positions of loading set forth above may be obtained by the comparison between the maximum loads obtained, and the breaking loads of successful machines when sand tested in the standard machines. A load factor of 2 under the above conditions of loading is desirable, but most machines during the War had a load factor of less than 1.5.

A more usual and simpler method of expressing the required load factor is in terms of the normal load, *i.e.*, the maximum flying weight of the machine. These load factors will of course differ for each of the standard positions of loading, and they will vary with the type of machine. Thus high-speed machines will obviously require a higher load factor than slow-speed machines. Fig. 1 sets forth the failing strength in up load with the C.P. forward, of a number of machines of approximately the same size, *i.e.*, about 400 sq. ft. area—plotted against the maximum speed on official test at 10,000 ft. The minimum safe load may approximately be represented by a line having the equation—

Load Factor—6.3 = 0.03 (Speed—100).

Fig. 2 shows the falling strength in upload with C.P. forward, of machines of various sizes and speeds, plotted against the area of the wings, the most satisfactory basis of comparison for machines of varied size. A line has been drawn approximately indicating the minimum safe load factor for the various sizes. From this line it would appear that the smaller the machine the greater the required factor of safety. This agrees with expectation, since small machines may be manœuvred more quickly than large machines.

Fig. 3 shows a similar chart to Fig. 2, in which all the readings have been given a speed correction derived from Fig. 1. This is a rough way of fixing the required load factor, and may be fairly criticised on this ground. Nevertheless it is more satisfactory than the erroneous theoretical methods which it replaced, and it has this advantage, that it was used for fixing the required factors of many of the most successful machines designed during the War.

The load factors of various German machines were examined by the writer as soon as the machines were captured. If the load factor given by the previous curves

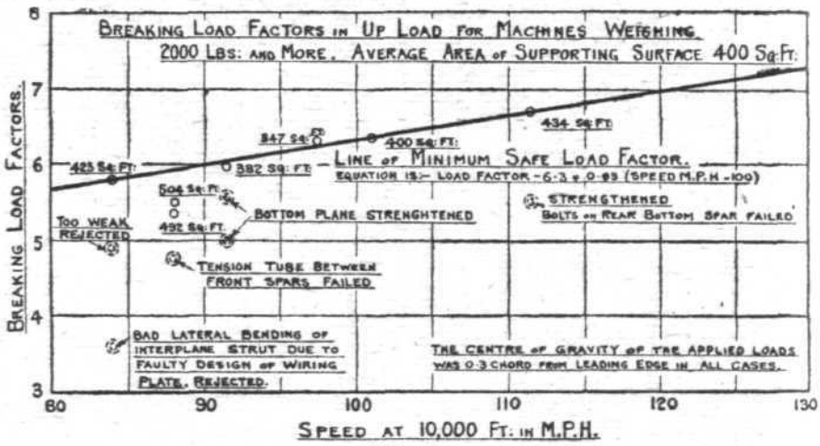


Fig. 1.

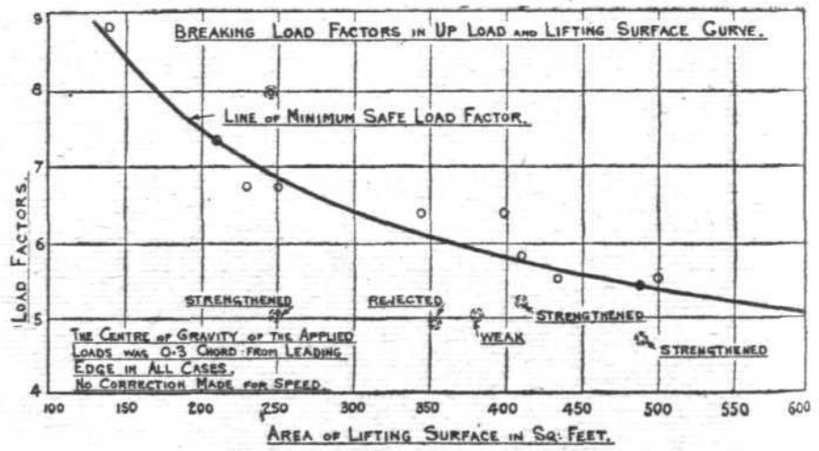


Fig. 2.

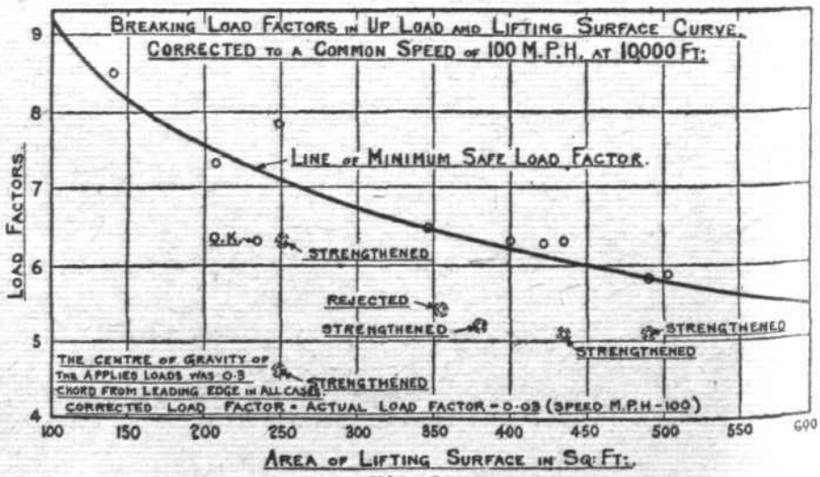


Fig. 3.

* Extracts from a paper read before the Institution of Aeronautical Engineers on March 15, 1921.

was not more than 1.5 times as great as the load factor of the corresponding German machine the upper figure was taken. This ruling ensured that type for type our machines were always stronger than the German machines. After this ruling had been in action a year, Gen. Brooke-Popham wrote one day stating that eight enemy machines had gone to pieces in the air that day simply by being chased by our fellows. The moral effect of knowing that our machines were always stronger than the enemy's must have been enormous and amply justified the slight increase in weight.

First Army Looping.—In the early part of the War the load factors required for various evolutions were determined by theoretical investigations. According to one estimation, the load factor in coming out of a nose dive was 12. Later this was reduced to 8. This also assumed that the load factor was the same for machines of all sizes. The calculated load factor of the B.E. 2C being only 4 to 4.5, and its strength on sand test less than 5.5, looping was forbidden. It happened, however, that they were accidentally looped several times when fighting, and the practice became common in the fighting squadrons. This was the state of affairs at the C.F.S. in the autumn of 1915, when the Commandant announced his intention of a week-end leave for a shooting excursion. The squadron decided to practise looping while the Commandant was away. Unfortunately the Commandant's shooting affair fell through, but he took the gun out over Gladiators Walk, the rendezvous of the would-be loopers. History does not relate what kind of sport the Commandant got, but it does relate that he turned up unexpectedly in the mess that night and complimented the squadron on the number of machines out of control over Gladiators Walk. From that day looping on B.Es. became a standard evolution. This experiment made it clear on a large scale that machines having a load factor of not more than 5 can be safely looped.

Down Load on Machines.—On first consideration the effect of down load does not appear of great importance. Actually it is of primary importance, and it is necessary to provide ample strength to meet the down load, which is of considerable magnitude on the front spars and leading edges in fast flying and nose diving. The phenomenon was explained by the writer in a paper read before the British Association in 1912, and it was shown to be due to the variation of the distribution of pressure at small angles. Under this distribution of pressure the front portion of the top surface of a wing is under compression while the rear portion is under suction, and the front portion of the lower surface is under suction while the rear portion is under compression. Thus at small angles a wing has a heavy torque placed upon it. The necessity for making adequate provision for this load is supplied by a number of accidents (several of which were mentioned by the lecturer.—ED.).

The cumulative effect of the above evidence is conclusive and secured permission to have all machines tested in down load. Sand tests of machines revealed the fact that the front portions of the wing collapsed with a down load of about 2. This factor was increased by 1 and all trouble ceased. It may be given as a rule that the down load factor should not be less than half that of the up load factor. The centre of pressure in down load should be taken at about 0.25 width from front edge.

Complete Structure with Vital Members Duplicated.—It is essential that the structure should be complete, and that every vital member should have a complementary member which in effect duplicates it so that if any vital member is destroyed the structure is still complete. Many lives have undoubtedly been saved during the War by attention to this point.

Induced Stresses.—It is still more essential that care should be taken to ensure that the structure is complete and that load on one member does not add an extra and uncalculated load upon a member already stressed. Examples illustrating this point taken from actual experience are as follows :—

(*a*) The loads from the lift and anti-lift wires should be taken straight across the body from one wing plate to the other. Many examples have been met with in which the full strength of the wings could not be developed without tearing them off the body.

(*b*) The points of attachment of the control mechanism should not be in the centre of the bays, but over the supports.

(*c*) The body and wing structures should be complete in both up load and down load. One disaster to a foreign-built machine was found to be due to the fact that the wing structure was not complete on the down load. Several machines have been condemned because they were not complete on down load.

(*d*) In the case of pusher machines, care should be taken to see that the wing structure, particularly the interplane struts, are strong enough to take the ordinary loads plus the load due to the tail plane or skid.

(*e*) The effect of tail bracing on column or points supporting the bracing should be carefully considered. One disaster to an experimental machine in which the tail twisted off was found to be caused by the bracing which introduced a toggle action in the centre of the cross tube.

Strength of Materials.—It is necessary to have informed and accurate ideas as to the properties, strength, methods of failure, and the like, of the various materials of construction before proceeding to apply any system of calculation. Average figures are useless. Calculations of such a vital structure as an aeroplane should be based on the strengths of the weakest specimens which are likely to be passed by the examiner. The result of this policy is that the calculated strength is invariably below the sand test figures, as it is unlikely that any one machine would be built of parts of minimum strength. Nevertheless safety demands that calculation should provide for that contingency.

Sand tests are as arbitrary as methods of calculation because of the conditions under which they are carried out. They are carried out in a dry, cool shop, on a machine which has been built under the most favourable conditions of temperature and dryness. The strength of the machine in this condition will obviously be higher than after being sodden with moisture in service, since the strength of spruce decreases at the rate of 300 lbs. per sq. in. for each 1 per cent. of moisture absorbed. 9 per cent. to 10 per cent. of moisture halves the strength of a machine. Tests of materials of construction should be made under as nearly as possible the same conditions as in practice. Thus :—

(*a*) Parts subjected to vibration should be tested under vibration. This principle was adopted in the latter sand tests to the extent of mounting vibrating apparatus on

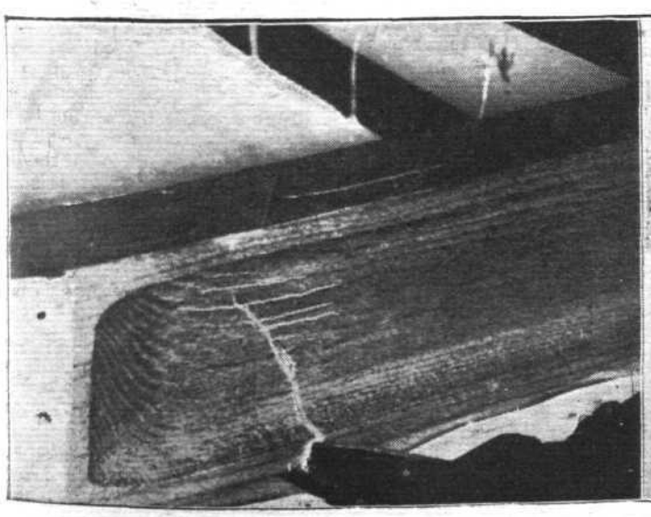


Fig. 4.

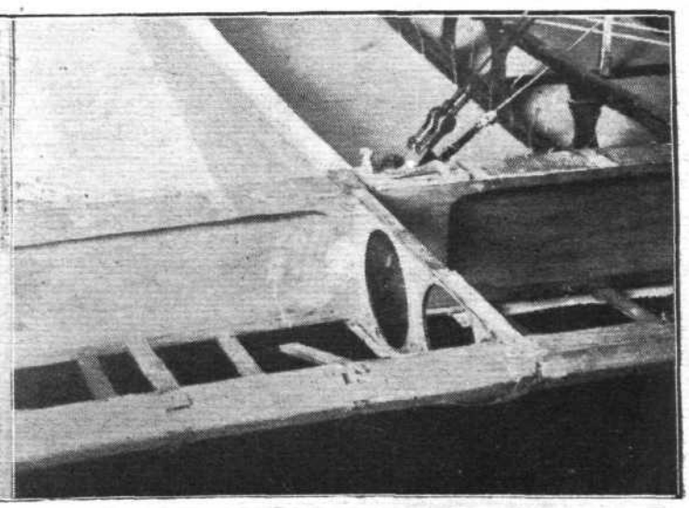


Fig. 5.

machines while being tested. Vibration often leads to unexpected results, and is beyond the scope of calculation. In one machine brought to the writer's notice the drag wires continually broke although strengthened by three to four times the calculated strength. After putting rubber blocks under the engine no further trouble was experienced, and the original wires were returned.

(*b*) Parts under combined stresses in practice should be tested under similar combination of stresses. This point is of the greatest importance. For instance, the principal wood used in the construction of aeroplanes is about twice as strong in tension as in compression, *i.e.*, 5,000 lbs. per sq. in. and 12,000 lbs. per sq. in. respectively.

When a spruce specimen is tested in pure bending it begins to fail on the compression side, and as the load increases the compression failure travels inward, causing a displacement of the neutral axis, until the failure is nearly two-thirds across the spar. Typical failures are shown in Figs. 4 and 5. This results in a stress diagram similar to that shown in Fig. 6.

Since all systems of engineering calculation are based on the theory that the material is elastic and bends in the arc of a circle, the neutral axis remaining unchanged, it necessarily follows that the apparent maximum skin stress is considerably greater than the actual skin stress at failure.

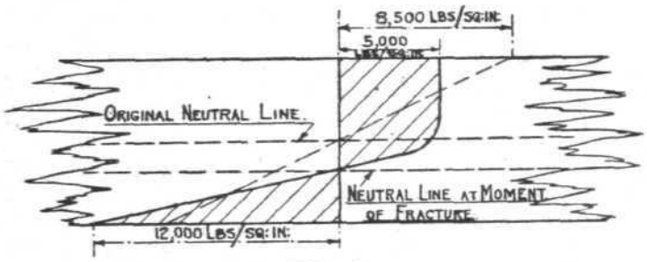


Fig. 6.

The apparent skin stress in spruce in bending is about 8,500, whereas the actual stress is only 5,000 lbs. per sq. in. No serious error is likely to arise from this misapplication of theory if the figure 8,500 is used in spars under pure bending. When, however, the spars are under combined bending and compression as in all wing spars the discrepancy is serious. Then if the spars begin to fail on the compression side it deflects, and the end load exerts a bending moment which increases the primary bending moment. The result is that the spars fail at an apparent stress much below the apparent failing stress in pure bending. A safe figure for grade A spruce in bending and compression is 5,500 lbs. per sq. in.

The importance of these points may be gathered from the fact that all machines calculated by the R.N.A.S. for the first two and a half years of the War were based on the assumption that the strength of spruce in combined bending and compression is 8,500 lbs. per sq. in., whereas during the same period all machines calculated by the Military Aeronautics Directorate and the Royal Aircraft Factory used the figure 5,500 lbs. per sq. in. In other words, all naval machines were 35 per cent. below calculated strength. As no system of mathematical calculation gives results varying more than 3 per cent. the futility of striving for mathematical perfection is apparent.

No blame should be attached to the R.N.A.S. calculators for this and other similar practical points which only college engineers of wide experience and intuition could be aware of. As however certain of the R.N.A.S. calculators reported that the Military and Factory methods were wrong, this fact should be mentioned in fairness to these departments.

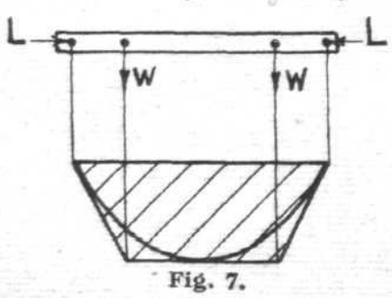


Fig. 7.

Method of Testing Materials. — One of the several suitable methods for testing wood is shown in Fig. 7. In this case the bending moment is applied by two loads at a distance from the supports, and the end load is applied in a known relation to the bending moment. The bending moment diagram, which is shown sectioned, approximates to the bending moment diagram of a universally loaded beam. When wooden beams are tested by the usual laboratory machines they invariably fail on the tension side, as shown in Fig. 8. Hence they give entirely misleading results.

Distribution of Pressure, Travel of Centre of Pressure, and End Effect.—Before proceeding with any method of calculation, the distribution of pressure over the whole wing, the end effect, and the travel of the centre of pressure on wings of the section to be used should be ascertained from the very valuable data provided by the N.P.L. For the purpose of sand test and calculation, it is usual to assume that the forward position of the centre of pressure is at 0.28 width from the front edge and that the rear position is 0.5 width. Sand tests under these conditions of loading were also carried out at the writer's request on the ribs. The distribution of the pressure over the wing surface from back to front is met by the above tests, but special consideration should be given to the end effect produced by the leakage of air from the sides. Curves showing the variation of pressure over the extensions may be considered, but according to fair average practice the pressure over the extension may be assumed to be parabolic up to a distance not exceeding 4/5 chord. According to good practice the overhang of the extension should not exceed 4/5 chord. Preferably, it should not exceed 2/3 chord. In calculating for down load the distribution cannot be assumed parabolic as above. Research is still required to determine the shape of the curve of end loading under down load.

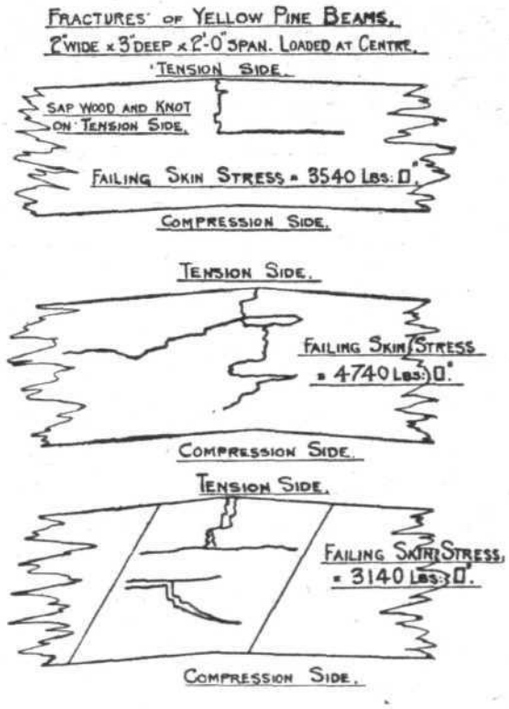


Fig. 8.

Methods of Calculation.—Any sound method of calculation will give equally satisfactory results if based on the correct foundation. A reliable and simple method used in calculating all British machines on active service at the Armistice is set forth in outline in Chapter IX of the writer's book on Elementary Aeronautics. A more highly mathematical method evolved by Mr. Berry can be recommended. The difference in the results obtained by the two methods does not exceed 3 per cent., which is negligible in comparison with the variation of the factors upon which they are based, an engineer's insight and judgment being of more importance than any mere method of calculation provided the method is sound, and in this opinion I am supported by the Americans.

Sources of Errors in Methods of Calculation.—All systems of calculation are based on the assumption that wood, steel, and other materials of construction are perfectly elastic up to the point of failure, and that the neutral line does not change its position relative to the section. They are also based on the further assumption that the points of support of the spars at the junction with the interplane struts remain in the same straight line independent of the joints in the spars, incidence, bracing, etc.

These assumptions differ so far from fact that any system of calculation based upon them is vitiated unless supported by factors derived from practical experience.

Another fact of great importance which has been neglected hitherto in all systems of calculation is the change of angle of incidence of the wings under load. The nearer the front and rear spars are together and the greater the length of the bays the greater is the difference between the angles of inclination at the interplane struts and in the middle of the bay. The effect of this variation is that the load in the centre of the bay is more intense than under the struts. In one machine tested by the writer the inclination of the wings under load increased 1 degree under the struts and 2½ degrees in the middle of the bay with the C.P. in the forward position. Thus in normal flight the wings in the middle of the bay would be loaded twice as much as under the struts.

Additional sources of error may be introduced by the type of wiring plates at the junction of the spars, struts, lift wires, and incidence wires. The writer has seen the following instances in which the structure failed before its full strength was developed owing to the wiring plate.

(*a*) Bolts connecting wiring plate to spar caused spar to split longitudinally, and the whole fitting travelled sideways. The diameter of the bolts was obviously too small.

(*b*) Lugs for the lift wires being off-set from the centre of connecting bolts caused the spar to split and the interplane struts to rotate through 20 degrees.

(*c*) Pull of lift wire caused rotation of wiring plate, which broke off end of interplane strut.

THE ROYAL AIR FORCE MEMORIAL FUND

A MEETING of the Executive Committee was held at the offices of the Fund, 7, Iddesleigh House, Caxton Street, on the 10th inst., Lord Hugh Cecil in the Chair. The Members of the Committee present were :—Air Vice-Marshal Sir John Salmond, K.C.B., Air Vice-Marshal A. V. Vyvyan, C.B., D.S.O., Air-Commodore H. R. M. Brooke-Popham, C.B., Sir Charles McLeod, Dame Helen Gwynne-Vaughan, Mr. H. E. Perrin, and Mr. W. S. Field.

The list of grants made since the previous Meeting on February 17, amounting to £83 7*s*. 8*d*., were approved.

The list of donations and subscriptions received since the same date was also presented, and includes on this occasion the sum of £22,300 6*s*. 9*d*., which consists of the balance of the Royal Air Force Aids Committee, and which, by a unanimous decision of the Committee of that organisation, is to be used for the benefit of officers and men, and their dependents under the rules of this Fund, the grand total therefore being £22,513 11*s*. 9*d*.

A sub-committee was appointed to meet fortnightly to assist the Secretary to deal with all applications for assistance from the Fund, it being arranged that the Secretary might make grants, pending the meeting of the sub-committee, in urgent cases, but that grants that could reasonably be reserved for the sub-committee, should be so reserved.

Mr. Perrin was appointed Chairman of this sub-committee, with Mr. Walter Field as a member. A lady and an Air Force serving officer are to be added to the sub-committee.

It was decided to purchase a presentation at the Royal School for daughters of Officers of the Army, Bath, such presentation to cost £120, it being a necessity that the officer concerned should have served in the commissioned ranks of the Army prior to joining the R.F.C. or R.A.F.

Air Vice-Marshal A. V. Vyvyan reported the constitution of a sub-committee to deal with rules for assistance to the post-war Royal Air Force.

The sale of the two houses at Ascot, presented to the Air Council by Mrs. M. E. Salting, has been fixed for April 19 next, the proceeds, by the kindness of the Air Council, being devoted to the Fund, and to be used, at Mrs. Salting's request, for the provision of scholarships at approved Schools for the children of officers.

The question of holding the Aerial Pageant in the north of England during the coming Summer was discussed, but was adjourned until a future date.

	£	*s*.	*d*.
Amount of donations and subscriptions announced up to February 16, 1921	105,355	8	11
Balance R.A.F. Aids Committee	22,300	6	9
Amount of donations and subscriptions announced up to March 9, 1921	213	5	0
Total	£127,869	0	8

CORRESPONDENCE

[The Editor does not hold himself responsible for opinions expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters intended for insertion in these columns.]

THE FLYING SERVICES FUND

[2040] The attention of my Committee has been drawn to the concluding paragraph of the proceedings of the R.A.F. Memorial Fund Committee published in your issue of February 24 last.

As worded this paragraph might convey the idea that the Flying Services Fund was about to cease its activities in the sense of giving assistance to ex-members of the Flying Services, but our intention was merely meant to convey that a certain number of cases, which had been kindly dealt with by the Flying Services Fund (administered by the Royal Aero Club) during the last year, and pending our organisation being completed, were, in future, to be taken over and dealt with by the R.A.F. Memorial Fund.

My Committee owe a debt of gratitude to the Flying Services Fund for all the work they have done on our behalf, and it is due to that Fund that any misapprehension should be removed.

Thanking you for kindly inserting this.

W. E. S. BURCH, *Lieut.-Col.*,
Secretary, The Royal Air Force Memorial Fund

March 14, 1921.

New Bohemian Aviation Company

FROM Prague it is reported that a new aviation company has just been established there. The firm, which is known as the Fales Aviation Company, will, it is stated, deal, in addition to ordinary passenger and goods conveyance, with aerial advertising, cartography, aerial photography and cinematography. Thus again, Bohemia shows her appreciation of the possibilities of aviation, and makes one more step towards her cherished ambition of making Prague a great aviation centre for central Europe.

At Buckingham Palace Afternoon Party

AMONGST those present at the Afternoon Party given by their Majesties the King and Queen at Buckingham Palace, on Thursday, March 10, were Wing-Commander the Hon. J. D. and Mrs. Boyle, Air-Commodore F. C. and Mrs. Halahan, Air-Commodore C. L. and Mrs. Lambe, Group-Captain A. M. and Mrs. Longmore, and Group-Captain A. J. L. Scott.

Canada Specifies I.A.C. Pilots Only

ACCORDING to a Washington message, the Canadian Air Board has decided that from May 1 no United States military, naval, or civilian aeroplane will be permitted to fly over Dominion territory, pending the organisation of a United States body with authority to issue certificates in accordance with the International Air Convention.

The Bolshies Lose a 'Plane

ON March 12, when attacks on Kronstadt by armoured cars over the ice were repulsed and one car sunk, a Bolshevist aeroplane operating at the same time was shot down by the Kronstadt guns.

An Italian Military Crash

FROM Milan it is reported that on March 8 two officers and two soldiers lost their lives in a military aviation accident near Campoformio, being burnt to death. They were taking a large new Caproni machine from Campoformio, in Venetia Giulia, to Gallarate, a distance of some 200 miles. This new machine carried 1,000 litres of benzine, and was driven by three engines. It was piloted by Lieut. Giovanni Venturello, of Turin, who was accompanied by Lieut. Anselmo Cortesina, also of Turin, and two mechanics. A preliminary trial seemed to show that the machine was in perfect order. Shortly after starting, when at a height of about 500 ft., the machine was seen to swerve to one side, as if one wing were giving way, and then it suddenly came down rapidly, crashing to the ground. The benzine caught fire, and all four occupants, who were probably first stunned and injured by the fall, were enveloped in flames and burnt, and it was impossible to approach the burning débris for some time.

LEGAL INTELLIGENCE

In the Prize Court

IN a case in the Prize Court, the Rt. Hon. Sir Henry Duke presiding, on March 8, Capt. Wilfred Perham, R.A.F., related how five seaplanes flew in line ahead over the German submarine U.C. 1, and reduced her to a wreck.

He was in command of 8682, flying in squadron formation with 8662, 8675, 8689 and N. 65, on July 24, 1917, near the North Hinder Light Vessel. Seaplane 8689 (Capt. Newton, D.S.O., R.A.F.) led and dropped bombs on either side of the submarine, which took effect in exploding. There were no survivors. The U.C. 1 had 18 on board.

His lordship said he thought a letter of Comdr. J. C. Porte, R.N.R., now deceased, and then in command of the N. 65, should be read.

Counsel said that Comdr. Porte, when asked if he would claim, wrote :—

"I do not propose to take any action in the matter. The amount of prize money available for distribution is small, and by the time it is divided up and law costs paid, it does not appear to me it is worth the trouble."

His Lordship : I have no doubt that is a note of protest that will receive attention. He was the commanding officer, but he had three men with him. Are their claims barred by his letter ?

Mr. Lewis : I doubt whether he could bar them.

His Lordship : I do not see how he could. He is in a fiduciary position. It is a matter of principle. I shall make a declaration that they are entitled to claim, and the award will be to the five seaplanes.

The amount to be divided between them is £90.

Bankruptcy Court

A PETITION was presented at Burton Bankruptcy Court on March 9 by Mr. F. E. Sanderson, for the winding-up of the Burton Aircraft and Manufacturing Co., Ltd., on behalf of Mr. H. De Vaux-Brougham, the Senior Official Receiver and Provisional Liquidator of Farrow's Bank. Counsel said that the Navarro Aircraft Co., Ltd., was incorporated as a private company in October, 1916. In the following year the name was altered to the Burton Aircraft and Manufacturing Co., Ltd., with a capital of £2,000. Debentures to the amount of £2,000 were issued to Mr. William Moore, of Mapperley, Nottingham, one of the directors of the company, and this money was provided by Farrow's Bank, Ltd., Mr. Moore being the bank's nominee.

It would appear, said counsel, that the whole of the 2,000 shares were the property of Farrow's Bank, Ltd. The company was indebted to Farrow's in the sum of £36,200 for cash advanced and also for interest as from June 30, 1920. The bank had made application to the company for payment, but the letter had been returned by the Post Office marked "Gone away."

Mr. Sanderson added that the assets of the company consisted of freehold premises in Lichfield Street, Burton, valued at £4,000, machinery worth about £3,000, timber worth £900, some book debts for certain amount of manufactured and partly manufactured goods. The liabilities of the company, excluding the debt to the bank, amounted to about £45,000. The company was insolvent and unable to pay its debts.

Mr. E. Wynne Humphreys, the provisional liquidator, offered no objection, and his Honour Judge Harold Newell, granted the petition.

SIDE-WINDS

BY a printer's error the price of the Regent Plate office inkstand was omitted from the advertisement of the Goldsmiths' and Silversmiths' advertisement in FLIGHT of March 3. The price is £1 5s., and the price of the silver cigarette box given as £2 15s., should have read £2 10s.

IN connection with the lecture which is being given by Sir Ross Smith at the Philharmonic Hall, it is interesting to know that the instruments used by Sir Ross on his flight from London to Australia were supplied by Messrs. S. Smith and Sons (M.A.), Ltd. These included revolution indicators, air-speed indicators, radiator thermometers, and Husun compasses No. 235; and the sparking plugs used were the famous K.L.G. plugs. In one of the views shown on the screen the Smith revolution indicator is actually shown on the *nacelle* of the engine. By way of additional interest, it should be noted that a complete exhibit of the Smith instruments and the K.L.G. plugs used on the flight are shown in the vestibule of the Philharmonic Hall.

IMPORTS AND EXPORTS, 1920-1921

AEROPLANES, airships, balloons and parts thereof (not shown separately before 1910). For 1910 and 1911 figures see "FLIGHT" for January 25, 1912; for 1912 and 1913, see "FLIGHT" for January 17, 1914; for 1914, see "FLIGHT" for January 15, 1915; for 1915, see "FLIGHT" for January 13, 1916; for 1916, see "FLIGHT" for January 11, 1917; for 1917, see "FLIGHT" for January 24, 1918; for 1918, see "FLIGHT" for January 16, 1919; for 1919, see "FLIGHT" for January 22, 1920; and for 1920, see "FLIGHT" for January 13, 1921.

	Imports		Exports		Re-Exportation	
	1920.	1921.	1920.	1921.	1920.	1921.
	£	£	£	£	£	£
Jan. ...	2,323	4,459	32,752	87,128	697	2,285
Feb. ...	9,320	2,379	68,932	59,829	—	19
	11,643	6,838	101,684	146,957	697	2,304

NEW COMPANY REGISTERED

FAIREY AVIATION, LTD.—Capital £100 in £1 shares. To adopt an agreement with the Fairey Aviation Co., Ltd. (incorporated in 1915), and the liquidator thereof,* and to carry on the business of manufacturers of and dealers in waterplanes, aeroplanes and aerial conveyances and aircraft of all kinds. First directors : C. R. Fairey, F. G. T. Dawson and C. O. Crisp. Solicitor : C. Crisp, 17, Throgmorton Avenue, E.C.

* This liquidation of the old company is purely a formality for the purpose of internal reconstruction, and the above new company under the same title was registered on the same day, and has acquired the undertaking of the old company and will discharge all its liabilities. The new company will carry on business as heretofore under the same management.

AERONAUTICAL PATENT SPECIFICATIONS

Abbreviations : cyl. = cylinder ; I.C. = internal combustion ; m. = motors

The numbers in brackets are those under which the Specifications will be printed and abridged, etc.

APPLIED FOR IN 1919

Published March, 17, 1921

19,150. E. SPREEKMEESTER. Propellers. (130,983.)
24,858. PHŒNIX DYNAMO MFG. CO., and W. O. MANNING. Steel structures for aeroplanes, etc. (158,933.)
25,418. VICKERS, LTD. and R. K. PIERSON. Tail skids. (158,951.)
27,444 and 27,447. O. E. MESSTER. Production of photographic pictures from aircraft. (134,853 and 134,854.)
27,544. B. G. CALVER. Locking devices for aircraft propellers, etc. (158,964.)
28,459. D. J. MOONEY and E. E. BROWN. Metal ribs and cross-members. (158,999.)
28,584. R. P. PESCARA. Screw propellers. (159,013.)
29,413. S. DE SANTIS. Stabilising of aircraft. (159,035.)
30,449. J. PEET. Rotary engines. (159,060.)
32,339. SPERRY GYROSCOPE CO. Gyroscopic compasses. (137,059.)
32,388. T. M. FINLEY. Aircraft. (159,079.)

APPLIED FOR IN 1920

Published March 17, 1921

24,464. E. A. SPERRY. Gyroscopic indicator for aircraft. (152,008.)

NOTICE TO ADVERTISERS

All Advertisement Copy and Blocks must be delivered at the Offices of "FLIGHT," 36, Great Queen Street, Kingsway, W.C. 2, not later than 12 o'clock on Saturday in each week for the following week's issue.

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The Aircraft Engineer and Airships

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6 " " ...	15	2	6 " " ...	16	6
12 " " ...	30	4	12 " " ...	33	0

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* *European subscriptions must be remitted in British currency.*

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